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In The UNITED STATES DISTRICT COURT
SOUTHERN DISTRICT OF CALIFORNIA

ALTON B. HORNBACK, Petitioner, v. The UNITED STATES OF AMERICA, Respondent.	Case No. '08 CV 0127 WQH BLM
	Pending Related Cases: 1. No. 07-CV-1694 JLS (AJB) 2. No. 07-CV-0289 JLS (AJB)

PETITION FOR WRIT OF MANDAMUS TO ORDER THE DIRECTOR OF PATENTS AND TRADEMARKS TO ISSUE A NEW PATENT WHICH CONFORMS TO RELATED ALLOWED PATENT APPLICATION

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ALTON B. HORNBACK, Petitioner, v. The UNITED STATES OF AMERICA, Respondent.	Case No. '08 CV 0127 WQH BLM PETITION FOR WRIT OF MANDAMUS TO ORDER THE DIRECTOR OF PATENTS AND TRADEMARKS TO ISSUE A NEW PATENT WHICH CONFORMS TO RELATED ALLOWED PATENT APPLICATION Pending Related Cases: 1. No. 07-CV-1694 JLS (AJB) 2. No. 07-CV-0289 JLS (AJB)

I. CAUSE OF ACTION

Petitioner Alton B. Hornback hereby petitions this Court to issue a WRIT OF MANDAMUS, pursuant to 28 U.S.C. 1361, ordering the Director of the United States Patent and Trademark Office to issue a new patent, pursuant to 37 U.S.C. 131, to replace Patent No. 6,079,666, titled "Real-Time Boresight Error Slope Sensor", so that it conforms to related allowed Patent Application No. 06/859,033.

The errors in that patent are so numerous, so stratigically placed, and so discernible when the text of that patent is compared with the text in that application that it neither defines the disclosed invention, nor establishes Petitioner as its legal owner.

II. STATEMENT OF JURISDICTION

Petitioner is now, and at all times referenced herein was, a resident of San Diego, California, within the Southern District of California which is within this Court's geographical jurisdiction.

Subject matter jurisdiction in this Court is set forth in 28 U.S.C. 1361. Thus, this Court has juridiction in this action.

III. STATEMENT OF THE CASE

On 25 April 1986 Petitioner filed a patent application (A01)[1], S/N 06/859,033, with the Patent and Trademark Office (PTO), for a "Real-Time Boresight Error Slope Sensor". That SENSOR finds its greatest utility in an ABM missile such as the Advanced Patriot PAC-3, operating in the altitude/velocity regime encountered in an anti-ballistic missile intercept, by suppressing catastrophic oscillations in a parasitic loop from body motion to apparent target motion and back through the guidance gain to body motion.

On 16 April 1987 that SENSOR was classified SECRET (A19) pursuant to Executive Order 12356[2]. On 24 August 1987 the PTO imposed a Secrecy Order (A20) on that application under 35 U.S.C. 181. On 17 September 1987 the PTO issued a "NOTICE OF ALLOWABILITY" (A22) stating that the application was "in condition for allowance" but that: "in view of the secrecy order issued August 24, 1987, under 35 U.S.C. (1952) 181, this application will be withheld from issue during such period as the national interest requires".

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[1] Axx denotes pages in the attached APPENDIX.

[2] Executive Order 12356 defines "SECRET" as: "'Secret' shall be applied to information, the unauthorized disclosure of which reasonably could be expected to cause serious damage to the national security".

On 21 April 1999 the 1987 Secrecy Order was rescinded. (A23). And on 27 June 2000 Patent No. 6,079,666, titled "Real-Time Boresight Error Slope Sensor", issued in Petitioner's name. (A24).

However, both the patent specifications and patent claims contained numerous material errors, too stratigically placed and too discernible when compared with the allowed patent application to be viewed as "typographical errors". Thus, the "Certificate of Correction" (A39) proposed by the PTO to correct its acknowledged errors in the patent specifications (A34), would clearly be inappropriate in form.

On 7 July 2006, Petitioner filed Case No. 06-CV-1387 BEN (AJB) in this Court for a "PETITION FOR WRIT OF MANDAMUS, PURSUANT TO 28 U.S.C. 1361, TO ORDER THE DIRECTOR OF PATENTS AND TRADEMARKS TO ISSUE A NEW PATENT WHICH CONFORMS TO RELATED ALLOWED PATENT APPLICATION". On 15 May 2007, that PETITION FOR WRIT OF MANDAMUS was denied, without prejudice, on the ground that Petitioner had not exhausted his administrative remedies.

So, to correct that alleged defect, on 25 May 2007 a Petition was submitted to the PTO to reissue the patent so that it conformed to the allowed patent application. On 25 July 2007 the PTO denied that Petition. (A32). On 2 August 2007, an Amended Petition was submitted to the PTO, again requesting reissue of the patent (A37). On 8 January 2008, that Amended Petition was also denied. (A41).

Accordingly, Petitioner has now clearly exhausted his administrative remedies, thus satisfying the requirements for refiling this "PETITION FOR WRIT OF MANDAMUS.

IV. ARGUMENT

1. Errors in Patent Claims (Columns 7 and 8)

On 1 May 1987, Petitioner filed "Amendment A CLASSIFIED ANNEX" (A42; D000337)[3] which contained new claims 3-6, claims 1-2 having been disallowed. Five days later, on 6 May 1987, Petitioner amended those claims (A47, D000322). EXHIBIT 12 (A52), dated 27 May 1987, shows that the PTO filed both communications -- one on 5/4/87 and the other on 5/11/87 -- before it allowed those claims. However, the claims as printed in the patent (A31) were, verbatim, those filed 1 May 1987, instead of the amended claims filed 6 May 1987.

2. PTO Purged **ALLOWED** Patent Claims From its Own Records

In its 25 July 2007 response to the PETITION to issue a new patent, the PTO included a proposed "CERTIFICATE OF CORRECTION" (A39) acknowledging its errors in the specifications, but denied that it had ever received the allowed patent claims, (A34):

> Second, the papers included with Enclosure 4 do not appear to be part of the official record. For example, the UNCLASSIFIED stamp and the annotations D000322-D000326 in the lower right hand corner do not appear in the Office's record.

First, pages D000322-D000326 (A47-A51a) contained the allowed patent claims. They were sent to Petitioner by DoJ on 4 October 2001 during discovery in Case No. 99-38 C. (A54). DoJ certified that it received a copy of pages D000288-D000425 from the PTO File Wrapper in 1991 which included pages D000322-D000326. (A55).

Second, the PTO stamp: "RECEIVED MAY 11 1987 GROUP 220 LICENSING AND REVIEW" appears on page D000322. (A47). (See A52).

[3] Pages denoted AXXa in this exhibit and in the following exhibit, indicate the extention of the 8.5"X14" page.

Third, in 1991 those pages were classified CONFIDENTIAL. Thus DoJ properly stamped those pages "UNCLASSIFIED" after they were declassified by DoD, but prior to sending them to Petitioner.

Therefore, if pages D000322-D000326 which contain the allowed patent claims, do not currently appear in the PTO's records, then the PTO, itself, purged those pages from its own records after it sent a copy of that PTO File Wrapper to DoJ in 1991. Note: DoD, not the PTO, was the benefactor of that shenanigan.

3. Conspiracy Between DoD and PTO to Print Invalid Claims

On 5 June 1998, Petitioner requested a copy of the patent application (A57) which he had not been permitted to retain after he lost his security clearance at retirement in January, 1988.

On 9 June 1999, after the patent application had been declassified a second time, the PTO sent Petitioner a copy of that application which included only the cancelled claims 1-2.

On 22 June 1999, Petitioner requested a copy of the allowed patent claims 3-6 (A58). On 21 July 1999, the PTO refused (A59):

> Your request for a copy of the application was for a copy of the application as originally filed and the application as originally filed contained only claims 1 and 2.

That is simply not correct! The text of that 5 June 1998 request for a copy of the patent application (A57), reads in toto:

> Subject: Request for Copy of Application No. 06/859,033
>
> Sir:
>
> Please mail copy of subject Patent Application to Applicant at address listed below. Enclosed, please find check in the amount of $15.00 for required fee.

Moreover, the specifications in that application included all corrections made during prosecution. So why not the allowed claims?

Answer: With malice aforethought, DoD did willfully conspire with the PTO to withhold from Petitioner, the allowed patent claims, thereby denying him the means to validate, a priori, the claim language to be printed in the patent. By Respondent's own statement (A61), the patent claims, as printed, were invalid!

Thus, the Government had established its defense in any patent infringement action.

4. Misrepresentation of Petition Submitted 2 August 2007

In its response dated 8 January 2008, the PTO stated (A41):

> Consideration has been given your request for the issuance of a certificate of correction for the above-identified patent received in the August 6, 2007. (sic)
>
> The errors requested to be corrected in the claims will not be entered. The broadening of claims may affect patentability of claims.

First, that is a gross misrepresentation of the Petition submitted on 2 August 2007. That Petition (A37) was clearly a petition to reissue the patent to correct PTO induced errors, and not a request for the issuance of a certificate of correction. The "Subject" of that letter reads:

> Amended Petition to Reissue Patent No. 6,079,666 so that it Conforms to Allowed Patent Application No. 06/859,033, Filed: 25 April 1986; Issued: 27 June 2000.

Second, refusal by the PTO to enter the requested corrections to the patent claims, even as a "Certificate of Correction" (A40), is, itself, sufficient justification to grant instant Petetion, given that Counsel for Defense in related Case No. 99-38 C, U. S. Court of Federal Claims, correctly requested the Court to: "declare all claims of U.S. Patent No. 6,079,666 invalid for failure to comply with the requirements set forth in 35 U.S.C. 112". (A61).

V. SUMMARY AND CONCLUSION

The only conceivable reason for the PTO to refuse Petitioner's request for a copy of the allowed claims (A59) prior to issuing the patent -- especially after those claims were declassified (A58) and the required fee was paid (A57) -- was to deny him the means to validate, a priori, the claim language to be printed in the patent.

Since a patent is in the public domain, the errors in the patent specifications were knowingly inserted by the PTO -- itself with no axe to grind -- at the direction of DoD, so as to let the patent issue, while simultaneously rendering it ununderstandable for counterintelligence purposes, after it had been withheld for 13 years "in the interest of national security".

If the subject matter in a patent application is sufficiently sensitive to warrant protection "in the interest of national security", the proper procedure is to impose a Secrecy Order on that application pursuant to 35 U.S.C. 181, which withholds the patent from issue. But once that Secrecy Order is rescinded, and the issue fee is timely paid, the applicant is entitled to a patent pursuant to 35 U.S.C. 131, which conforms to the associated patent application as it existed at the time it was "in condition for allowance", and not bastardized by errors inserted into the patent, either for counterintelligence purposes, or as a means to avoid compensation for unauthorized use of the disclosed invention.

WHEREFORE, Petitioner respectfully requests that instant PETITION FOR WRIT OF MANDAMUS be granted.

Date 23 January 2008

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APPENDIX

APPENDIX

EXHIBIT NUMBER/TITLE	Page
1. Patent Application No. 06/859,033 ----------------------	A01
2. Classification Letter Original Classification Authority -	A19
3. 1987 Secrecy Order --------------------------------------	A20
4. NOTICE OF ALLOWABILITY ----------------------------------	A22
5. RESCINDING ORDER --	A23
6. Patent No. 6,079,666 ------------------------------------	A24
7. PTO response to 25 May 2007 to Reissue Patent -----------	A32
8. Amended Petition, dated 2 August 2007, for PTO to Reissue Patent --	A37
9. PTO Response to 2 August 2007 Petition to Reissue Patent	A41
10. Amendment A CLASSIFIED ANNEX ----------------------------	A42
11. SUPPLEMENTAL Amendment A CLASSIFIED ANNEX ---------------	A47
12. PTO Communication, Dated 5-27-87, Indicating its Filing of EXHIBITS 10 and 11 ----------------------------	A52
13. DoJ Response to Discovery Requests (Excerpts) Case No. 99-39 C, U.S. Court of Federal Claims ----------	A54
14. Request for Copy of Patent Application ------------------	A57
15. Request for Copy of Allowed Claims ----------------------	A58
16. PTO Denial of Request for Copy of Allowed Claims 3-6 ----	A59
17. ANSWER (Excerpts), Case No. 99-38 C U.S. Court of Federal Claims ----------------------------	A60

REGULAR UTILITY

EXHIBIT 1

Form PTO-436
(Rev. 8/78)

SERIAL NUMBER (series of 1979)	PATENT DATE	PATENT NUMBER
859033		

SERIAL NUMBER	FILING DATE	CLASS	SUBCLASS	GROUP ART UNIT	EXAMINER
06/859,033	04/25/86	~~343~~ 244	3.19	~~222~~ ~~221~~ 3641	WESSON

APPLICANTS: ALTON B. HORNBACK, SAN DIEGO, CA.

CONTINUING DATA***********************
VERIFIED NONE
GG---------

FOREIGN/PCT APPLICATIONS**********
VERIFIED NONE
GG---------

***** SMALL ENTITY *****

Foreign priority claimed: ☐ yes ☒ no; 35 USC 119 conditions met: ☐ yes ☐ no; Verified and Acknowledged — Examiner's Initials: GG	AS FILED →	STATE OR COUNTRY	SHEETS DRWGS.	TOTAL CLAIMS	INDEP. CLAIMS	FILING FEE RECEIVED	ATTORNEY'S DOCKET NO.
		CA	3	2	1	$ 170.00	6021270

ADDRESS:
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TITLE: REAL TIME BORESIGHT ERROR SLOPE SENSOR

U.S. DEPT. of COMM.-Pat. & TM Office — PTO-436L (rev.

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REAL TIME BORESIGHT ERROR SLOPE SENSOR ~~(U)~~

ABSTRACT ~~(U)~~ Of The Disclosure

~~(U)~~ In a missile which employs a terminal homing seeker and a proportional navigation guidance law the space rate of change of boresight error, i.e., the boresight error slope, is one of the predominant error sources.

~~(S)~~ It has been found that the boresight error slope is proportional to the curvature of the seeker open loop transfer characteristic. Accordingly, the boresight error slope sensor senses the curvature of the seeker open loop transfer characteristic. This is accomplished by intermittently dithering the seeker instantaneous field-of-view about the line of sight at a rate too great for the normal tracking loop to respond. Thus the open loop transfer characteristic is obtained while leaving the normal tracking loop unperturbed. The curvature of the open loop transfer characteristic is then obtained in real time by computing the "second differences" from the measured open loop transfer characteristic.

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Patent Application

Of

Alton B. Hornback

REAL TIME BORESIGHT ERROR SLOPE SENSOR ~~(U)~~

1.0 BACKGROUND ~~(U)~~

1.1 Field of the Invention ~~(U)~~

~~(U)~~ This invention is in the field of missile guidance and relates to a device which senses, in real time, the boresight error slope.

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a'

~~MCDONNELL DOUGLAS ASTRONAUTICS COMPANY~~ ~~HUNTINGTON BEACH, CA~~

Contract No. ~~F04704-84-C-0122~~ IAAD No. 111172			☐ Regrade ~~OADR~~ OCT '79
Classified by ~~BMO-PLANS & ADV PROGRAMS-SCG7~~ AFAL/DLM (GD) EGLIN AFB		☐ Downgrade To	On
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1.2 The Prior Art ~~(U)~~

~~(U)~~ In a missile which employs a terminal homing seeker and a proportional navigation guidance law, the space rate of change of boresight error, i. e., the boresight error slope, is one of the predominant error sources. This slope is defined as a small change in boresight error divided by a small change in aspect angle. With a proportional navigation guidance law, it ~~all that~~ is required ~~to hit the target is~~ that the line-of-sight (LOS) to the target not rotate in inertial space. Thus an error in line-of-sight rate rather than an error in LOS angle, per se, is the predominamt error. When the boresight error slope (denoted by m) is multiplied by body rate (denoted by $\dot{\theta}$) an error in LOS rate (denoted by $\Delta\beta$) is produced. Since $\Delta\beta$ is in a parasitic loop from body rate to apparent target motion, through the guidance gain, and back to body rate it can cause erratic instabilities.

U ~~(C)~~ Various approaches have been used to minimize either the boresight error slope or its effect on missile guidance. These include:

a. ~~(U)~~ Reducing guidance loop gain or increasing guidance time constant. This compromises guidance accuracy.

b. ~~(U)~~ Controlling radome wall thickness during the fabrication process by machine grinding or forming. This is expensive, time consuming, and usually yields a boresight error slope greater than about 0.06 degrees per degree.

c. ~~(U)~~ Preflight mapping the boresight errors, storing these errors in a look-up table and actively compensating for the errors during flight. Although residual errors after compensation have been measured as low as 0.01 deg/deg this is very expensive since each radome must be individually mapped. Also, this does not compensate for inflight variation of errors.

d. U ~~(C)~~ Opening the guidance loop and introducing a known dither, in both pitch and yaw, of the body axis about the velocity vector while the seeker is still tracking the target. The measured LOS ~~boresight~~ rate ~~angle~~ is then compared with that expected from the known dither rate ~~attitude~~ to obtain the LOS rate ~~boresight~~ error. This technique may introduce

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U ~~(C)~~ oscillation into an otherwise marginally stable missile. It takes considerable time and energy because of the two-axis dither. The dither is necessarily slow because of missile response time; therefore the data may not be in real time for hypersonic flight where the radome statistics are changing rapidly. This method has never been tested, ~~although it was proposed for the HEDI (high endoatmospheric interceptor) for the SDI (strategic defense initiative) program.~~

~~(U)~~ It has been found that for supersonic flight at high altitude with low aerodynamic q, a boresight error slope (m) < 0.01 deg/deg is required to prevent the parasitic loop from causing the missile to go unstable. Thus the foregoing approaches to reducing m may not be satisfactory.

2.0 OBJECTS AND ADVANTAGES ~~(U)~~

~~(U)~~ The real time boresight error slope sensor described herein is an inexpensive device capable of reducing the line-of-sight rate errors contributed by the radome or IR dome in real time from whatever the cause. The various sources of nonzero m include those ~~arizing~~ arising from aerodynamic heating from supersonic or hypersonic flight such as ablation, plasma, char and erosion, as well as those from external sources such as frequency agility or irradation by a high energy laser. This is accomplished in real time which is necessary if the dome statistics are time varying.

3.0 DRAWING FIGURES ~~(U)~~

~~(U)~~ Figure 1 shows the nonlinearity of three characteristic curves for three different look angles.

~~(U)~~ Figure 2 is a functional block diagram of the antenna beam dither generator.

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(U) Figure 3 is a functional block diagram of the boresight error slope sensor with a scale factor (AGC) correction loop.

4.0 PHYSICAL PRINCIPLE (U)

(S) During a research program to employ a microwave RF (radio frequency) seeker in a hypersonic missile, this inventor discovered that the curvature of the seeker open loop transfer characteristic (i.e. output voltage vs. look angle measured from electrical boresight) was proportional to the boresight error slope. The pertinent results of this research are shown in Figure 1. Curve 1 shows that the transfer characteristic is slightly curved upward (concave) at a look angle of 1 deg off the nose where the boresight error slope m, was found to be +0.05 deg/deg. Curve 2 shows that the transfer characteristic is a straight line at an LOS = 7 deg where m = 0. Curve 3 shows that the transfer characteristic is dramatically curved downward (convex) at 15 deg where m = -0.12 deg/deg.

(C) Although the research was performed at RF it is reasonable to assume that the relationship between boresight error slope and transfer characteristic nonlinearity is not frequency dependent. Accordingly the physical principle of this invention applies to infra-red (IR) as well as RF seekers. However, only the boresight error slope of an RF seeker with a gimballed phase monopulse antenna or a phase interferometer will be described.

(U) If the antenna beam is caused to dither intermittently at a rate too great for the tracking loop to respond, then the seeker tracking loop is open insofar as the dither is concerned. However the normal tracking loop is left unperturbed. The real time sensed seeker output voltage vs. look angle TCR can then be determined, without interfering with normal tracking.

(C) There are three properties of the transfer characteristic which are pertinent to this patent. First the transfer characteristic (TC) may be a straight line with any slope (not to be confused with boresight error slope) but with the null shifted away from antenna array normal. The amount the

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~~(C)~~ electrical null is shifted from array normal is the boresight error and can not be sensed by the device described herein. Second the slope of the TC is a measure of tracking loop gain and is sensed in this device. Third, the nonlinearity of the TC in the neighborhood of the LOS is a measure of the boresight error slope. This is also sensed by this device and is the key to this invention. The magnitude and sense of the boresight error slope are proportional to the magnitude and sense respectively of the transfer characteristic nonlinearity in the neighborhood of the line-of-sight.

5.0 FUNCTIONAL DESCRIPTION ~~(U)~~

~~(U)~~ Two identical channels (pitch and yaw) are required. Only the pitch channel will be described.

5.1 Beam Dither Generator ~~(U)~~

~~(U)~~ Refer to Figure 2. A pulsed sawtooth dither waveform generator 4 generates a sawtooth voltage waveform $V_D(t)$ with the following parameters:

(a)	~~(U)~~	Duty Factor:	$\overline{DF} = 0.1$
(b)	~~(U)~~	Pulse repetition frequency:	PRF = 100 pps
(c)	~~(U)~~	Pulse duration:	$\tau = 1$ ms.
(d)	~~(U)~~	Sawtooth frequency:	$f_c = 10$ KHz
(e)	~~(U)~~	Pulse repetition interval	$T = \frac{1}{PRF} = 0.01$ sec

~~(U)~~ Values of the foregoing parameters can be justified for the following reasons:

a. ~~(U)~~ Duty Factor: A dither duty factor ($\overline{DF}$) no greater than about 10% is required so that no perturbation exists for approximately 90% of the time, thus leaving the normal tracking loop virtually unperturbed.

b. ~~(U)~~ PRF: A PRF much greater than the normal tracking loop bandwidth, typically 5 to 10 Hz, is required, again so that the normal tracking loop cannot respond to the perturbations. Thus, a dither PRF = 100 pps appears reasonable.

c. ~~(U)~~ Pulsewidth: The pulsewidth from items a and b ~~A and B~~ is $\tau = \frac{\overline{DF}}{PRF} = 1.0$ ms.

d. ~~(U)~~ Carrier Frequency: Approximately 10 cycles are ~~is~~ desired in order to yield good average values when the result is averaged over one pulsewidth. Thus, a dither carrier frequency of

$$f_c = \frac{N}{\tau} = \frac{10}{1 \times 10^{-3}} = 10 \text{ KHz}$$

appears reasonable.

e ~~(U)~~ Amplitude: The peak value of the waveform is chosen to shift the beam ±0.5 beamwidths about the nominal electrical boresight axis.

~~(U)~~ The output voltage $V_D(t)$ from the dither waveform generator (4) is coupled to an adder 6 via a shielded conductor 5. This voltage is added to V_m which is coupled to the adder 6 on a shielded conductor 7 from the boresight error slope computer 27, described later. The sum $V_S(t)$ is applied to the dither phase shifter 9 via a shielded conductor 8. The dither phase shifter 9 can be either an analog phase shifter (ferrite) or digital (PIN diodes). An analog phase shifter is used here. The dither phase shifter 9 is in one arm B of a phase monopulse antenna 10. RF is fed from subarray B of antenna 10 to the dither phase shifter 9 via waveguide 11. The output of the dither phase shifter 9 is coupled to the magic T 13 via waveguide 12. RF from subarray A of antenna 10 is fed to the magic T 13 on waveguide ~~wave guide~~ 14.

~~(U)~~ The magic T 13 forms the complex sum, (Σ), and complex difference, (Δ), of the two RF voltages on waveguides 12 and 14. These are fed to the Σ and Δ mixers (not shown) on waveguides 15 and 16 respectively where they are converted to ΣIF and ΔIF, respectively.

~~(C)~~ (U) The antenna beam center 17 is caused to dither with respect to array normal 18 in accordance with the sawtooth waveform $V_D(t)$.

It is inertialess scanning and can be as rapid as we please, even 10,000 times per second (f_c = 10 KHz).

5.2 Boresight Error Slope Sensor ~~(U)~~

~~(U)~~ The boresight error slope sensor is implemented as two feedback loops. The first is the boresight error slope correction loop. It is a phase correction loop with the dither phase shifter 9 (figure 2) as the follow-up device since the antenna is a phase monopulse antenna. If the seeker were an IR sensor, the boresight error slope correction could be implemented with an open loop computation. The second loop is an AGC (automatic gain control) loop to correct for scale factor error.

~~(U)~~ Refer to figure 3. The boresight error slope sensor requires two inputs from the seeker receiver. The first is the antenna servo output usually low-pass filtered to about 10 Hz. This is denoted by ε(t) and is a voltage proportional to the angle of the LOS from electrical boresight. It is sometimes called the dynamic lag. ε(t) is coupled to the boresight error slope sensor on a shielded conductor 19. The second input is the video from the ratio detector which forms the ratio $Re\left[\frac{\Delta}{\Sigma}\right]$. The video is usually pulses for a pulsed radar, although other types of wide bandwidth signals such as those received from passive IR or cw jammers, may be accepted. This wide band video is coupled to the boresight error slope sensor via coax cable 20.

(a) Boresight Error Slope Correction Loop ~~(U)~~

~~(U)~~ If the LOS is at electrical boresight the receiver difference channel IF, (i.e. ΔIF) is zero and the voltage on coax 20 is zero. If the LOS is within the Σ beamwidth (i.e. FOV) but not at boresight the ratio detector

~~(U)~~ output on coax 20 is proportional to the LOS angle off boresight. This differs from $\varepsilon(t)$ on 19 in that $\varepsilon(t)$ is low pass filtered to about 10 Hz whereas $Re\left[\frac{\Delta}{\Sigma}\right]$ on 20 is wide band video (of the order of a few MHz).

~~(U)~~ The received video on coax 20 and the dynamic lag $\varepsilon(t)$ on shielded cable 19 are processed in a signal processor comprised of the sample-and-hold circuit 21 and a coincidence detector ~~2.2~~ 22. For a pulsed radar there must be at least one sample per pulse. Alternatively, the sampling rate (Nyguist Sampling Theorem) must be at least twice the information bandwidth, or two samples per cycle of information. This sample is held for the received pulse repetition interval. The sample rate and the hold period are set by the associated radar parameters. With the sample rate and the hold duration properly chosen and the beam dithering, the output voltage on conductor 23 is a time varying voltage denoted by $V_{DR}(t)$, the instantaneous value of which is proportional to the angle between the Δ pattern beam null and the LOS. $V_{DR}(t)$ is compared in the coincidence detector 22 with the lag voltage $K\varepsilon(t)$ on conductor 24. K is the gain of the AGC amplifier 25. At the instant $V_{DR}(t) = K\,\varepsilon(t)$ the output of the coincidence detector on conductor 26 is a delta function or unit impulse $\delta(LOS)$. The time of occurance of $\delta(LOS)$ is the time the signal $V_{DR}(t)$ received as a result of the rapid antenna beam dither (open loop) equals the low pass filtered voltage $K\varepsilon(t)$ of the tracking loop (closed loop).

~~(U)~~ The unit impulse $\delta(LOS)$ on conductor 26 is fed to the boresight error slope computer 27 along with the voltage $V_{DR}(t)$ on conductor 23 from the sample-and-hold 21. Recall that $V_{DR}(t)$ is the rapidly time varying received voltage resulting from antenna dither. This voltage $V_{DR}(t)$ is sampled in the boresight error slope computer 27 by the unit impulse $\delta(LOS)$ to yield a voltage $V_{DR}(LOS)$. This is the value of the voltage $V_{DR}(t)$ at the instant the antenna beam or field-of-view is at the position it would be if the beam were not dithering and the tracking loop were closed. In other words the value of the transfer characteristic at the LOS has been obtained, and without disturbing the tracking loop.

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~~(S)~~ Now the value of the transfer characteristic a small angle either side of LOS is desired. This is obtained from a unit impulse occuring at LOS ± Δt from the clock in the dither waveform generator 4 and coupled to the boresight error slope computer 27 via conductor 28. Note that the unit impulse δ(LOS) on conductor 26 is also fed to the dither waveform generator 4. Thus a small increment of time Δt is added to or subtracted from the time of occurance of δ(LOS) to yield δ(LOS ± Δθ). This holds since the dither waveform is a ~~sawtook~~ sawtooth, hence the angular excursions of the antenna beam or field of-view are linear functions of time. Therefore a voltage V_{DR}(LOS ± Δθ) is generated by sampling $V_{DR}(t)$ with the delta function δ(LOS ± Δθ). In other words the value of the transfer characteristic at LOS ± Δθ in the neighborhood of the line of sight has been obtained. A boresight error slope correction voltage V_m is now formed in the boresight error slope computer 27 from the relation

$$V_m = \left[V_{DR}\ (LOS + \Delta\theta) - V_{DR}\ (LOS)\right] - \left[V_{DR}\ (LOS) - V_{DR}\ (LOS - \Delta\theta)\right]$$

Notice that if the transfer characteristic is a straight line, the two terms in brackets are equal and $V_m = 0$. Thus this "second difference" method yields a correction voltage V_m proportional to the nonlinearity of the transfer characteristic. And this was shown in figure 1 and Section 4.0 to be proportional to the boresight error slope. V_m is fed to the adder 6, figure 2, via shielded cable 7. A voltage proportional to body rate $\dot{\theta}$ is fed to the boresight error slope computer 27 on shielded cable 29 to determine the sense of V_m. The boresight error slope correction loop is now complete.

(b) AGC Loop (Scale Factor Correction Loop) ~~(U)~~

~~(U)~~ An automatic gain control (AGC) or scale factor correction voltage is generated in the AGC computer 30 in much the same manner as the boresight error slope correction voltage V_m was generated.

~~(C)~~ The voltage $V_{DR}(t)$, the instantaneous value of which is proportional to the angle of the Δ null from LOS, is fed to the AGC computer

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~~(C)~~ 30 from the sample-and-hold 21 via conductor 23. Also fed to the AGC computer 30 is the unit impulse δ(LOS) from the coincidence detector 22 via conductor 26. δ(LOS) samples $V_{DR}(t)$ to form a voltage $V_{DR}(LOS)$ just as was done in the boresight error slope computer. Now the value of the transfer characteristic a small angle either side of LOS $V_{DR}(LOS \pm \Delta\theta)$ is also generated in the AGC computer 30 by sampling $V_{DR}(t)$ by a delta function $\delta(LOS \pm \Delta\theta)$ fed to the AGC computer 30 from the dither waveform generator 4 via conductor 31 just as was done in the boresight error slope computer. In fact the voltage $V_{DR}(LOS)$ and $V_{DR}(LOS \pm \Delta\theta)$ generated in the boresight error slope computer 27 could be used in the AGC computer 30.

~~(C)~~ Here the similarity ends. The AGC loop depends upon the difference between the voltages from the actual received transfer characteristic TCR and the corresponding voltages from the ideal transfer characteristic TCA. Since the dither driving function is a sawtooth, the instantaneous angle of the antenna Δ pattern from the array normal is linearly proportional to the dither voltage $V_D(t)$. Accordingly the dither voltage $V_D(t)$, coupled to the AGC computer via conductor 32, is sampled by δ(LOS) and $\delta(LOS \pm \Delta\theta)$ to yield $V_D(LOS)$ and $V_D(LOS \pm \Delta\theta)$ respectively from the ideal transfer characteristic. An AGC correction voltage V_{AGC} is then generated from the relation.

$$V_{AGC} = \left[V_{DR}\ (LOS \pm \Delta\theta) - V_{DR}\ (LOS)\right] - \left[V_D\ (LOS \pm \Delta\theta) - V_D\ (LOS)\right]$$

If the two voltages in brackes are equal, the AGC voltage is zero and the open loop transfer characteristic TCR coincides with the ideal transfer characteristic TCA. The AGC voltage V_{AGC} is applied to the AGC amplifier 25 via conductor 33 to control the gain of the AGC amplifier 25, thereby yielding a better estimate of ε(t) on conductor 24 than would otherwise be available. The output of the AGC amplifier 25 is fed to the autopilot via conductor 34.

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6.0 CONCLUSION ~~(U)~~

~~(U)~~ It is concluded that the REAL TIME BORESIGHT ERROR SLOPE SENSOR described herein can sense and reduce the boresight error slope in real time from whatever the cause of nonzero slope. These include high temperature gradients from aerodynamic heating, frequency agility, ablation, plasma, char, erosion, and irradiation by a high energy laser.

~~(C)~~ Since the boresight error slope is sensed by measuring the curvature of the seeker open loop transfer characteristic, the technique is independent of carrier frequency. Accordingly this patent applies to infra-red (IR) seekers as well as radio frequency (RF) seekers.

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Claims: I claim: ~~(U)~~

~~(C)~~ 1. Electronic circuits comprising:

a. (U) a waveform generator and

b. (U) an additive means to use output of said waveform generator to cause a dither of the seeker instantaneous field-of-view about the electrical boresight axis and

c. (U) a receiver to receive the time varying signal resulting from said dither and

d. (U) a signal processor to generate a seeker transfer characteristic from said time varying signal and

e. (C) a computer to generate a voltage proportional to the curvature of said transfer characteristic and

f. (C) an additive means to use said voltage to reduce the boresight error slope.

~~(U)~~ 2. The invention of claim 1, further including an automatic gain control loop comprising:

a. (U) an AGC computer to generate an AGC voltage proportional to the deviation of the transfer characteristic of claim 1 from the ideal transfer characteristic and

b. (U) an additive means to use said AGC voltage to control the gain of the normal tracking loop.

add a¹
add a²
add a³

-12-

- A14 -

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GLOSSARY (U)

(u)	LOS	Line of sight
(u)	m	boresight error slope
(u)	$\dot{\theta}$	body rate
(u)	$\Delta\dot{\beta}$	error in line-of-sight rate
(u)	RF	Radio frequency
(u)	IR	Infra-red
(u)	TC	Transfer characteristic (seeker output voltage vs look angle relative to electrical null
(u)	TCR	Received transfer characteristic
	TCI	Ideal transfer characteristic
(u)	DF	Duty factor
(u)	PRF	Pulse repetition frequency
(u)	τ	Pulse duration
(u)	f_c	Sawtooth frequency
(u)	T	Pulse repetition interval $T = \frac{1}{PRF}$
(u)	N	Number of cycles f_c during τ, $(N = f_c \tau)$
(u)	$V_D(t)$	Voltage output of dither waveform generator
(u)	V_m	Voltage output of m computer
(u)	$V_S(t)$	$V_D(t) + V_m$
(u)	$\varepsilon(t)$	Antenna servo dynamic lag
(u)	$RE\left[\frac{\Delta}{\Sigma}\right]$	Ratio detector output
(u)	Σ	Antenna sum pattern or sum voltage
(u)	Δ	Antenna difference pattern or Δ voltage
(u)	$V_{DR}(t)$	Voltage output of sample and hold
(u)	$\delta(x)$	Unit impulse occuring at x
(u)	t	running time
(u)	Δt	small increment in time
(u)	V_m	Voltage proportional to boresight error slope
(u)	VAGC	Voltage proportional to difference in slope of ideal transfer characteristic and measured transfer characteristic
(u)		

- A 15 -

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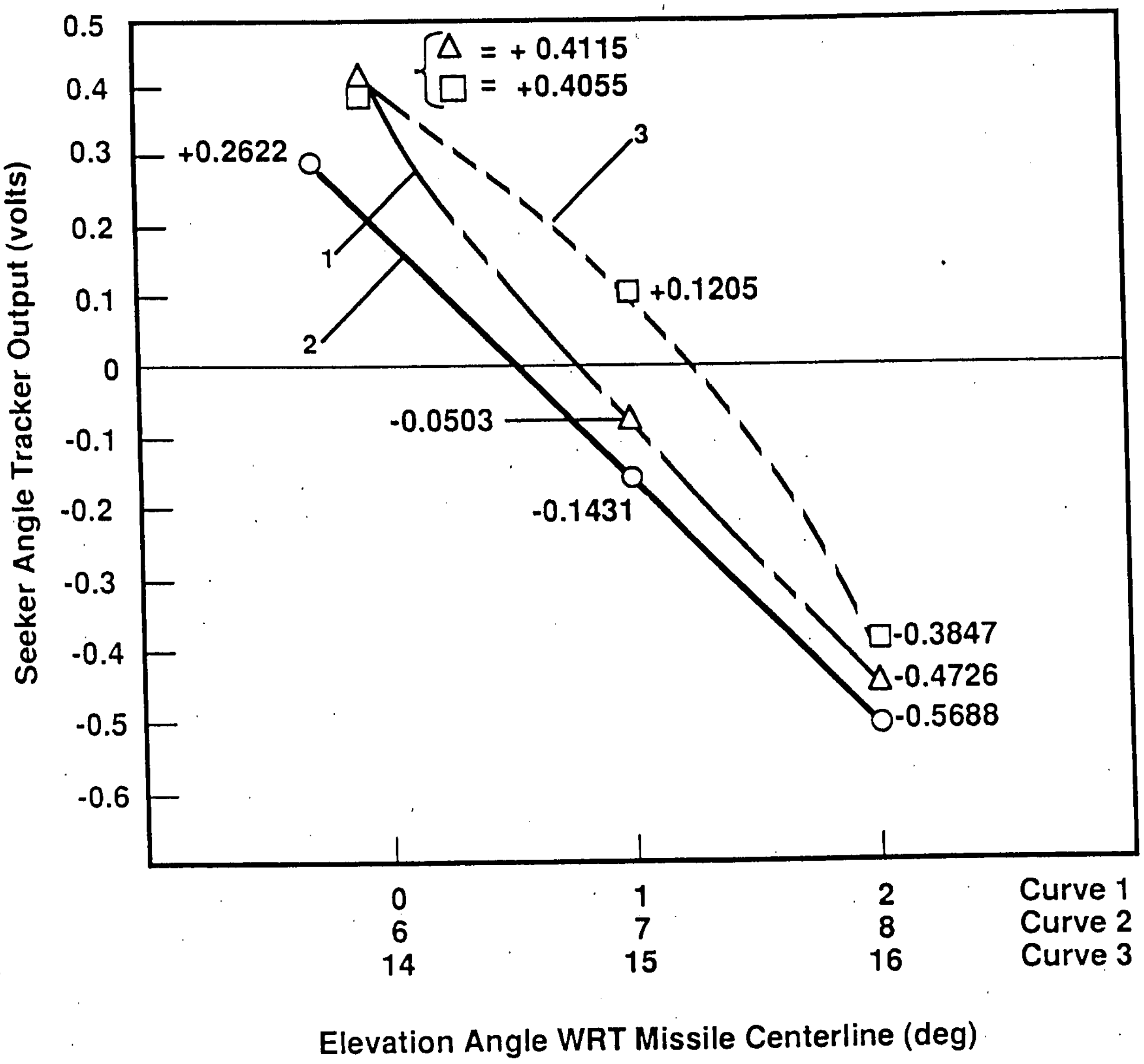

0.5
0.4
0.3
0.2
0.1
0
-0.1
-0.2
-0.3
-0.4
-0.5
-0.6
Seeker Angle Tracker Output (volts)
Δ = + 0.4115
□ = +0.4055
+0.2622
3
1
2
+0.1205
-0.0503
-0.1431
-0.3847
-0.4726
-0.5688
0 1 2 Curve 1
6 7 8 Curve 2
14 15 16 Curve 3
Elevation Angle WRT Missile Centerline (deg)

Figure 1. Transfer Characteristics

-A16-

244 3.19

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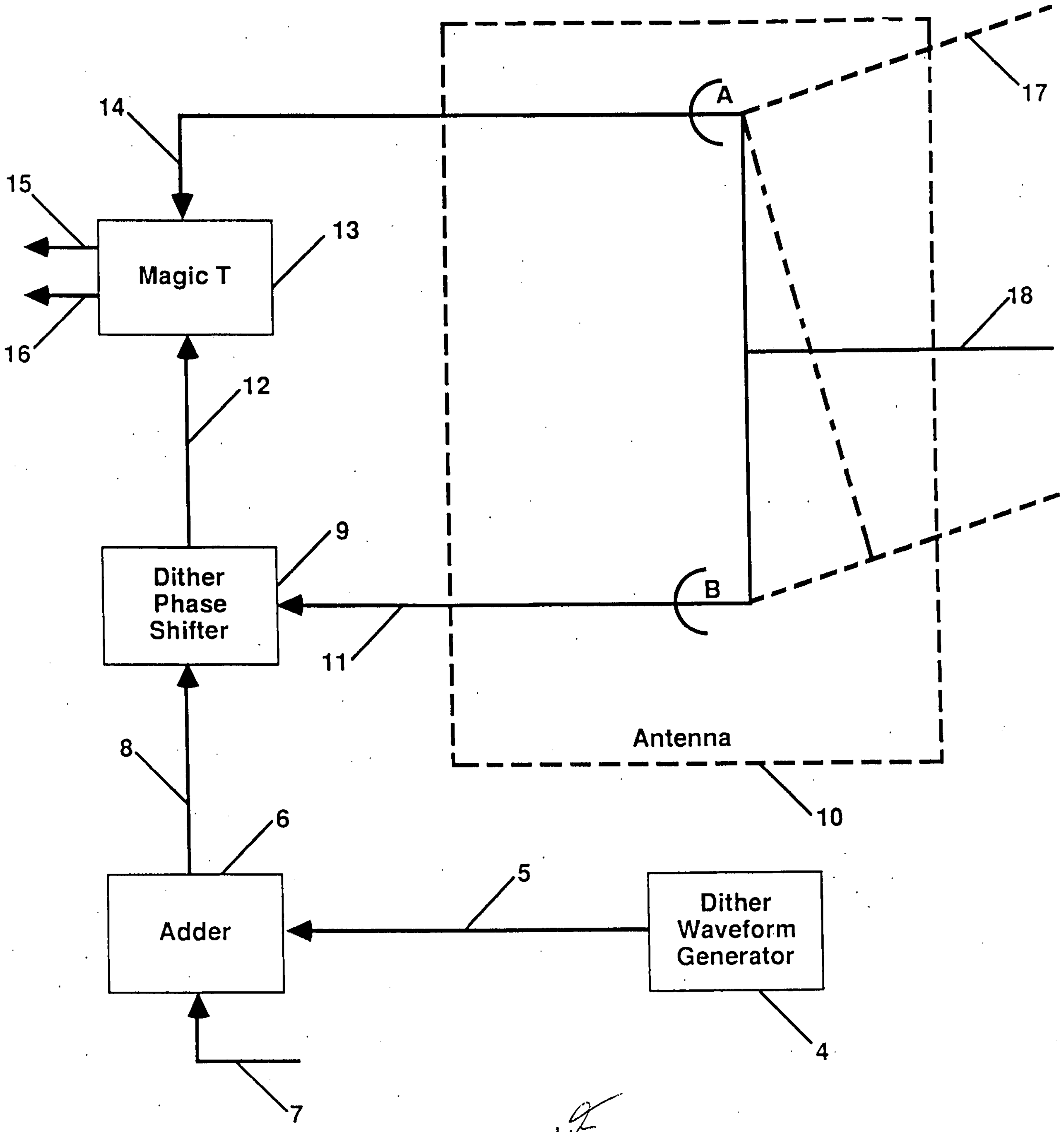

Magic T
Dither
Phase
Shifter
Adder
Dither
Waveform
Generator
Antenna
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Figure 2. Beam Dither Generator

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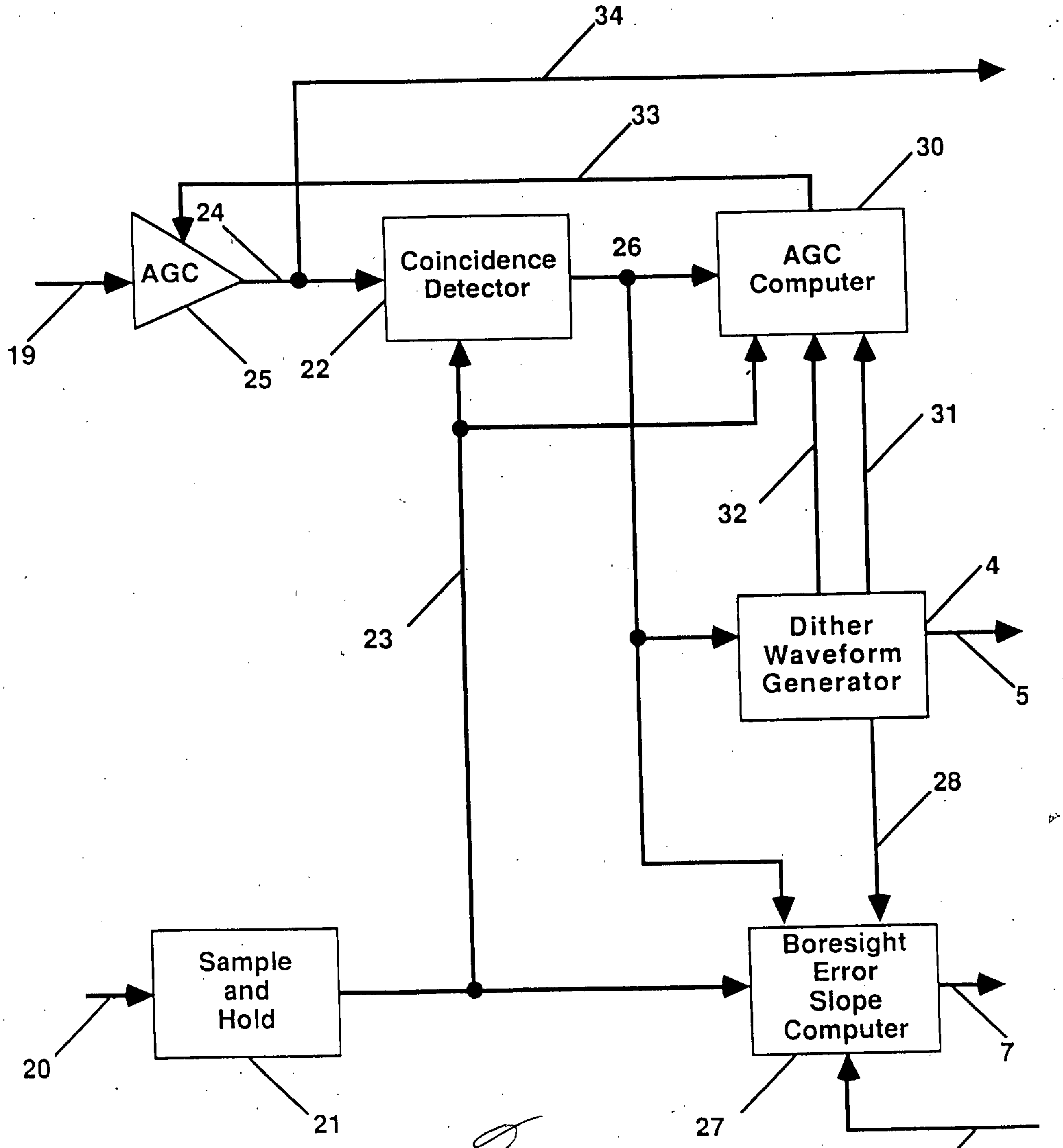

34
33
30
24
AGC
Coincidence Detector
26
AGC Computer
19
25
22
31
32
23
4
Dither Waveform Generator
5
28
Sample and Hold
Boresight Error Slope Computer
7
20
21
27
29

-18-

Figure 3. Boresight Error Slope Sensor

-A18-

DEPARTMENT OF DEFENSE · UNITED STATES OF AMERICA

DEPARTMENT OF THE AIR FO[RCE]
AIR FORCE WEAPONS LABORATORY (AFSC)
KIRTLAND AIR FORCE BASE, NM 87117-6008

EXHIBIT 2

REPLY TO ATTN OF: TA

16 Apr 87

SUBJECT: Security Classification Guidance

EXHIBIT 2

TO: McDonnell Douglas Astronautics Company
Attn: Mr A.B. Hornback
5301 Bolsa Ave
Huntington Beach CA 92647

1. Reference your request, received 10 Mar 87, for security classification guidance regarding the report entitled "Real-Time Boresight Error Slope Sensor (U)". Your report is considered classified. Please use the attached security classification guide to determine appropriate paragraph markings.

2. Should you have any further questions regarding classification guidance, please contact the Armament Laboratory/DLM, Eglin AFB FL 32542-5434 in accordance with section I, paragraph 2 of the attached security classification guide.

Charles W. Rogers

CHARLES W. ROGERS, Col, USAF
Chief, Technology Assessment Office

1 Atch
Guided Weapons Technology
Security Classification Guide,
dated 14 Dec 83 (U)

m.B

UNITED STATES DEPARTMENT OF COMMERCE
Patent and Trademark Office
ASSISTANT SECRETARY AND COMMISSIONER
OF PATENTS AND TRADEMARKS
Washington, D.C. 20231

EXHIBIT 3

Serial No.: 859,033 Filed: 4/25/86

Applicant: Alton B. Hornback

PAT. & T.M. OFFICE
MAILED

Title: REAL TIME BORESIGHT ERROR SLOPE SENSOR

AUG 24 1987
LICENSING & REVIEW

To be protected at Classification Level of:

Top Secret,
XXX Secret
Confidential
Special Instructions:

Sponsoring Agency & Address:

U.S. AF/JACP
Chief, Patent Div.
1900 Half. St. S.W.
Washington, DC 20324

SECRECY ORDER AND PERMIT FOR DISCLOSING CLASSIFIED INFORMATION

(Title 35, United States Code, sections 181-188 (1952))

NOTICE: To the applicant(s) above named; his, her, or their heirs; and any and all of the assignees, licensees, attorneys and agents, hereinafter designated principals:

You are hereby notified that the above-identified patent application has been found to contain subject matter which discloses classifiable information. The unauthorized disclosure of such subject matter would be detrimental to the national security, and you are ordered to keep the subject matter secret (as required by 35 U.S.C. 181) and you are further ordered NOT TO PUBLISH OR DISCLOSE the subject matter to any person except as specifically authorized herein.

Any other patent application already filed or hereafter filed in the U.S. or any foreign country which contains any significant part of the subject matter of the above-identified patent application falls within the scope of this Order. If such other patent application is not under a Secrecy Order imposed by the U.S. Patent and Trademark Office, it and the common subject matter need to be brought to the attention of the Director, Group 220, Attn: Licensing and Review, U.S. Patent and Trademark Office, Washington, D.C. 20231 as soon as possible.

Publication or disclosure of the subject matter of the above-identified patent application, except as authorized herein or subsequently by the Commissioner of Patents and Trademarks, may subject the person publishing or disclosing the subject matter to the penalties of 35 U.S.C. 182, 185 and 186 (1951).

The subject matter of the above-identified application has been determined to be encompassed by E.O. 10865, entitled "Safeguarding of Classified Information Within Industry" or E.O. 12356, entitled "National Security Information" and thus is subject to the "Industrial Security Manual for Safeguarding Classified Information."

The principals shall protect the subject matter as required by the Industrial Security Manual for Safeguarding Classified Information and may disclose the subject matter of the above-identified application to other persons having the requisite clearance on a "need-to-known basis" provided the person to whom the subject matter is disclosed is furnished with a copy of this Secrecy Order and is informed that this Secrecy Order is applicable to the subject matter disclosed. The declassification, in whole or in part, of the subject matter of the above-identified application does not modify this Secrecy Order. The requirements of this Secrecy Order remain in effect until the Secrecy Order is rescinded or modified by the Commissioner of Patents and Trademarks. The fact that the subject matter as a whole is declassified should be brought to the attention of the sponsoring agency.

This permission to disclose does not authorize the disclosure of the subject matter of the above-identified application through (1) the filing of any foreign application without specific permission of the Patent and Trademark Office, or (2) the export of any item or data without any export license which may be required.

This order should not be construed in any way to mean that the Government has adopted or contemplates adoption of the invention disclosed in this application and it is not any indication of the value of such invention.

for Kenneth L. Cage
Director, Special Laws Administration

EXHIBIT 4

U.S. DEPARTMENT OF COMMERCE
Patent and Trademark Office

Address : COMMISSIONER OF PATENTS AND TRADEMARKS
Washington, D.C. 20231

SERIAL NUMBER	FILING DATE	FIRST NAMED APPLICANT	ATTORNEY DOCKET NO.
06/859,033	04/25/86	HORNBACK	A 6023270

ALTON B. HORNBACK
5650 BLOCH STREET
SAN DIEGO, CA 92122

EXAMINER	
JORDAN, C	
ART UNIT	PAPER NUMBER
221	10

DATE MAILED: 09/17/87

EXHIBIT 4

This is a communication from the Examiner in charge of your application.

Commissioner of Patents and Trademarks

NOTICE OF ALLOWABILITY (FORM D-10)

This application is now in condition for allowance, and the prosecution is closed. However, in view of the secrecy order issued August 24, 1987, under 35 U.S.C. (1952) 181, this application will be withheld from issue during such period as the national interest requires.

The allowable claims are: 3-6

Charles Jordan/rg
(703)-557-4911
08-31-87

CHARLES T. JORDAN
EXAMINER

-A22-

PTOL-258 (REV 6-84)

EXHIBIT 5

UNITED STATES DEPARTMENT OF COMMERCE
Patent and T... mark Office
Address: COMMIS... OF PATENTS AND TRADEMARKS
Washington, D.C. 20231

SERIAL NUMBER	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.
06/859,033	04/25/86	HORNBACK	A 6021270

07M1/0421

EXAMINER
JORDAN, C

ALTON B. HORNBACK
5650 BLOCH STREET
SAN DIEGO CA 92122

EXHIBIT 5

#23

ART UNIT	PAPER NUMBER
3641	

DATE MAILED: 04/21/99

RESCINDING ORDER

The Secrecy Order dated 8-24-87 prohibiting disclosure or publication of the subject matter of the above entitled application under the provisions of Title 35 United States Code (1952) 181-188 is herby rescinded. Normal prosecution is continued and any suspension thereof because of the secrecy order should now the removed. This rescinding order does not affect the provisions of any classified government contract or existing laws relating to espionage and national security.

For Director
Special Laws Administration Group

PTO-216 (REV. 6-93)

- A23 -

EXHIBIT 6

US006079666A

United States Patent [19]

Hornback

[11] **Patent Number:** 6,079,666

[45] **Date of Patent:** Jun. 27, 2000

[54] **REAL TIME BORESIGHT ERROR SLOPE SENSOR**

[76] Inventor: Alton B. Hornback, 5650 Bloch St., San Diego, Calif. 92122

[21] Appl. No.: 06/859,033

[22] Filed: Apr. 25, 1986

[51] Int. Cl.^{7} F41G 7/00

[52] U.S. Cl. 244/3.19; 244/3.16; 244/3.15

[58] Field of Search 244/3.19, 3.15, 244/3.16

[56] **References Cited**

U.S. PATENT DOCUMENTS

4,303,211 12/1981 Dooley et al. 244/3.19

OTHER PUBLICATIONS

Waymeyer, W. K. and Macala, G. A., "Intercept Guidance and Control Concepts Demonstration", AFATL-TR-79-59, pp. 74–79, Feb. 1978.

Yost, D. J., Weckesser, L. B. and Mallalieu, R. C., "Technology Survey of Radomes for Anti-Air Homing Missiles", FS-80-022, Johns Hopkins University Applied Physics Laboratory, Mar. 1980.

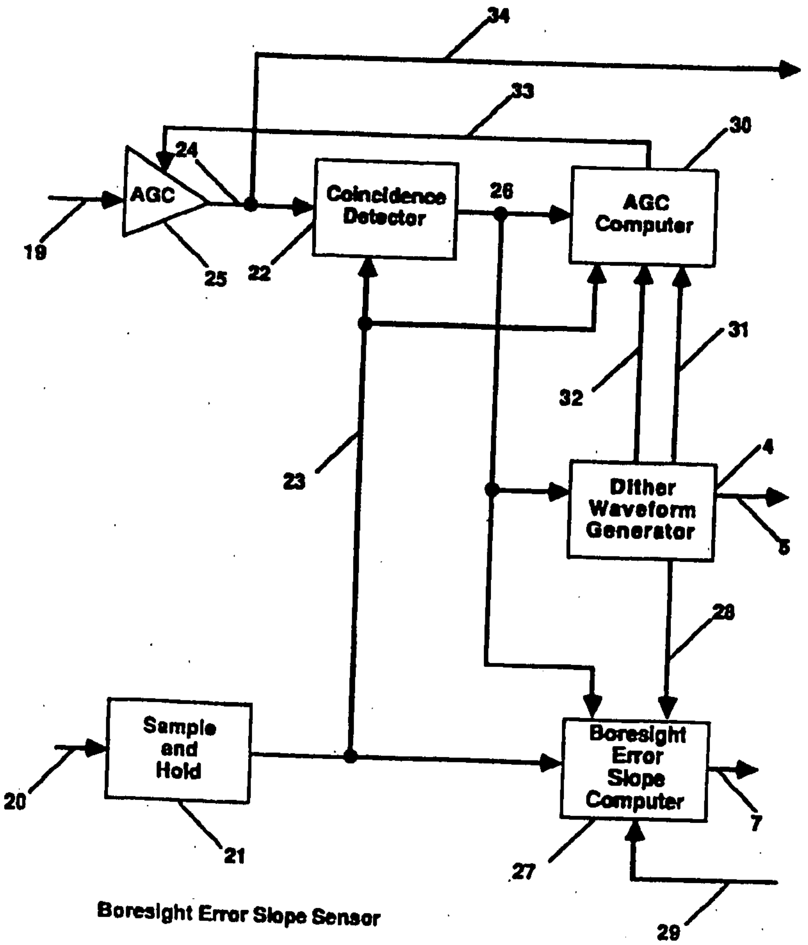
Primary Examiner—Charles T. Jordan
Assistant Examiner—Theresa M. Wesson

[57] **ABSTRACT** EXHIBIT 6

In a missile which employs a terminal homing seeker and a proportional navigation guidance law the space rate of change of boresight error, i.e., the boresight error slope, is one of the predominant error sources.

It has been found that the boresight error slope is proportional to the curvature of the seeker open loop transfer characteristic. Accordingly, the boresight error slope sensor senses the curvature of the seeker open loop transfer characteristic. This is accomplished by intermittently dithering the seeker instantaneous field-of-view about the line of sight at a rate too great for the normal tracking loop to respond. Thus the open loop transfer characteristic is obtained while leaving the normal tracking loop unperturbed. The curvature of the open loop transfer characteristic is then obtained in real time by computing the "second differences" from the measured open loop transfer characteristic.

4 Claims, 3 Drawing Sheets



Boresight Error Slope Sensor

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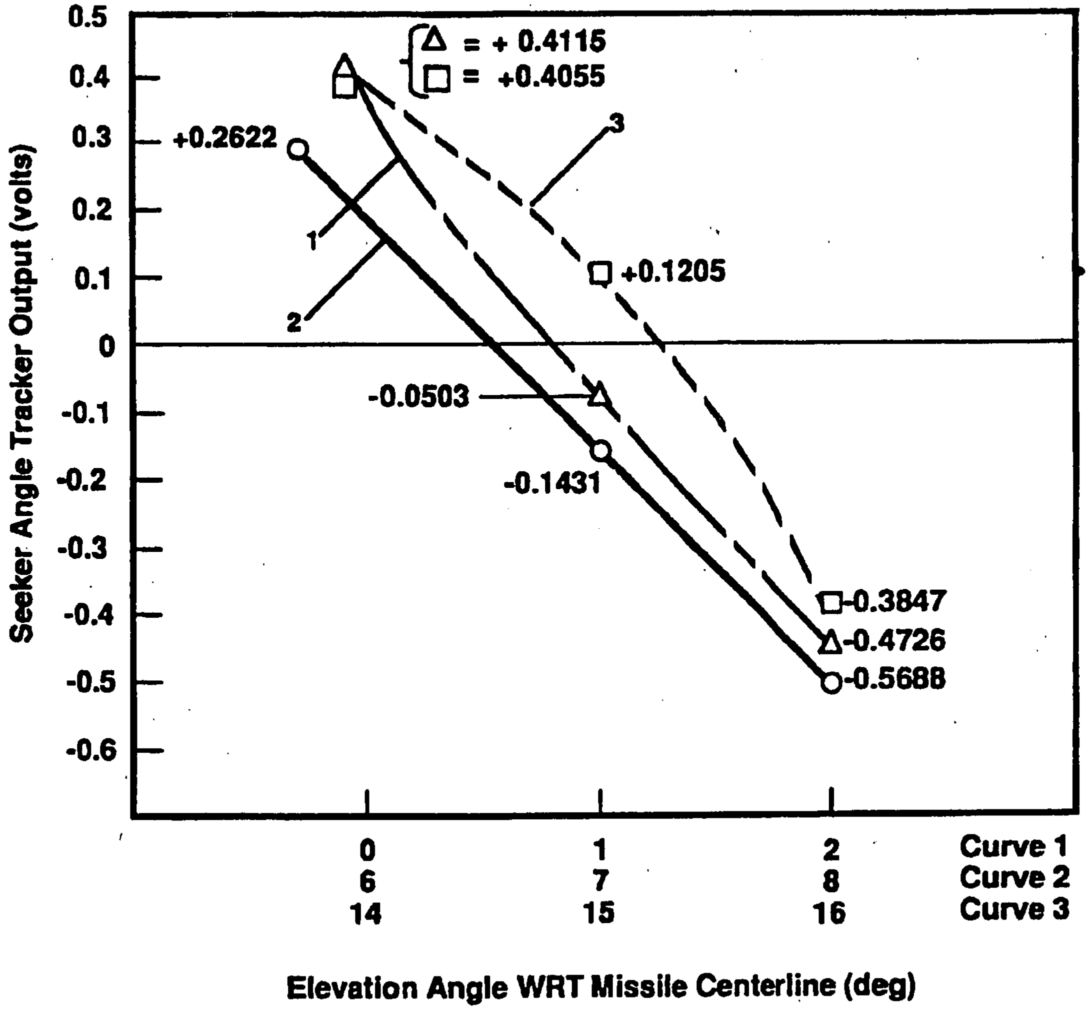

Δ = + 0.4115
□ = +0.4055
+0.2622
3
1
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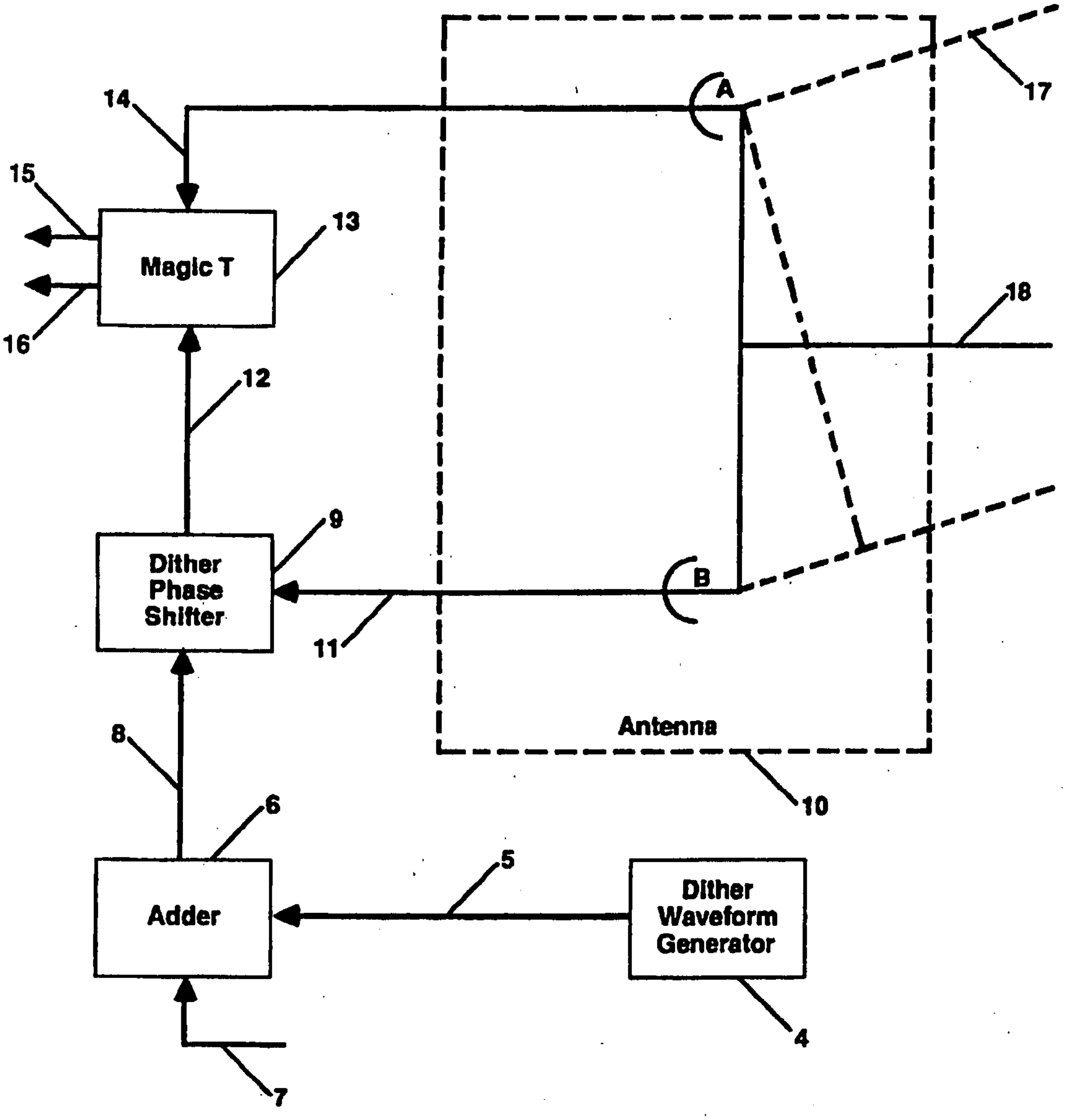
+0.1205
-0.0503
-0.1431
-0.3847
-0.4726
-0.5688
0.5
0.4
0.3
0.2
0.1
0
-0.1
-0.2
-0.3
-0.4
-0.5
-0.6
Seeker Angle Tracker Output (volts)
0 1 2 Curve 1
6 7 8 Curve 2
14 15 16 Curve 3
Elevation Angle WRT Missile Centerline (deg)

Figure 1. Transfer Characteristics

-A25-



14
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Dither
Phase
Shifter
B
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Antenna
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6
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5
Adder
Dither
Waveform
Generator
4
7

Figure 2. Beam Dither Generator

-A26-

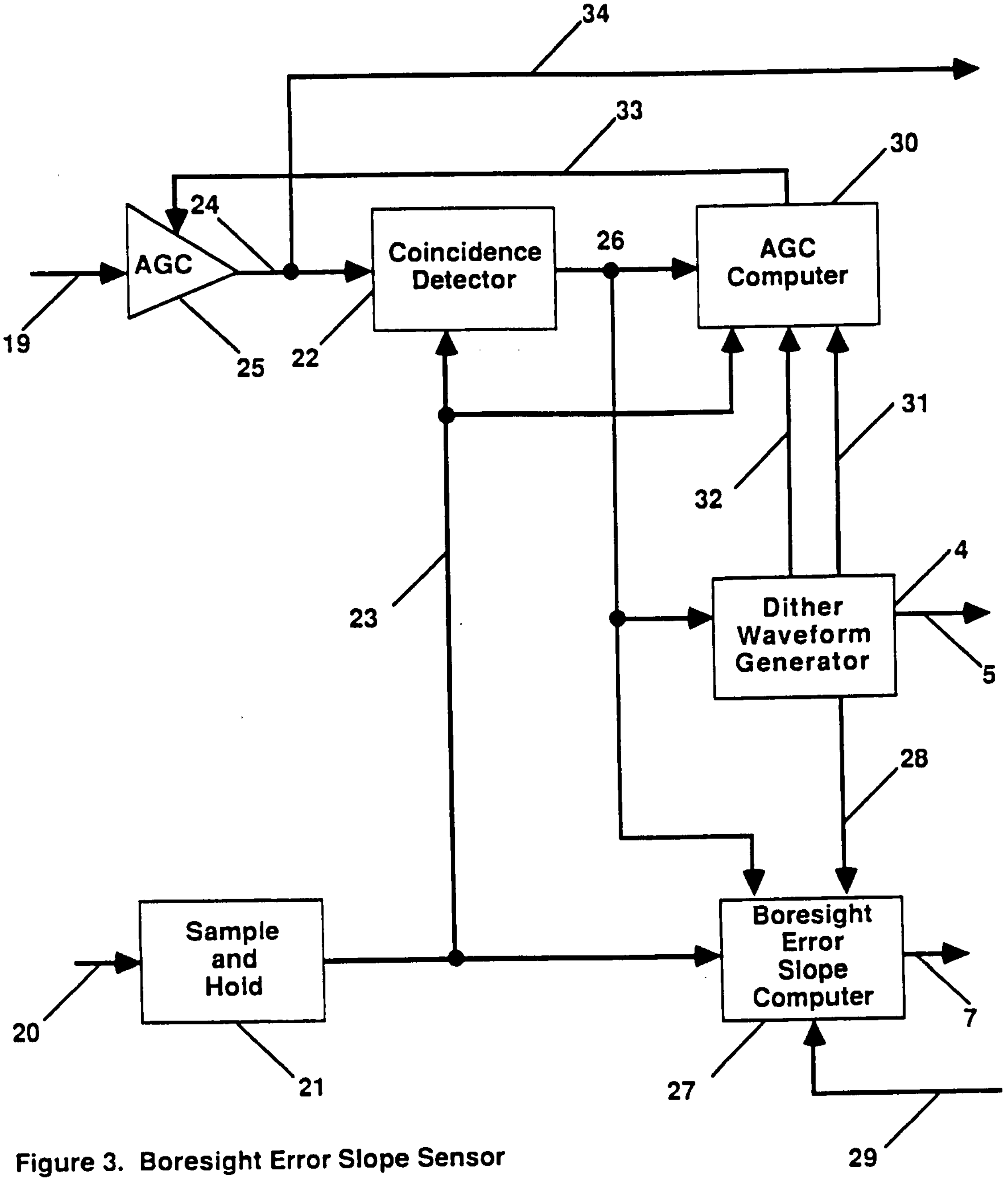
34
33
30
24
AGC
Coincidence Detector
26
AGC Computer
19
25
22
31
32
4
23
Dither Waveform Generator
5
28
Sample and Hold
Boresight Error Slope Computer
20
7
21
27
29

Figure 3. Boresight Error Slope Sensor

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REAL TIME BORESIGHT ERROR SLOPE SENSOR

1.0 BACKGROUND

1.1 Field of the Invention

This invention is in the field of missile guidance and relates to a device which senses, in real time, the boresight error slope.

1.2 The Prior Art

In a missile which employs a terminal homing seeker and a proportional navigation guidance law, the space rate of change of boresight error, i.e., the boresight error slope, is one of the predominant error sources. This slope is defined as a small change in boresight error divided by a small change in aspect angle. With a proportional navigation guidance law, it is required that the line-of sight (LOS) to the target not rotate in inertial space. Thus an error in line-of sight rate rather than an error in LOS angle, per se, is the predominamt error. When the boresight error slope (denoted by m) is multiplied by body rate (denoted by $\dot{\theta}$) an error in LOS rate (denoted by $\Delta\dot{\beta}$) is produced. Since $\Delta\dot{\beta}$ is in a parasitic loop from body rate to apparent target motion, through the guidance gain, and back to body rate it can cause erratic instabilities.

Various approaches have been used to minimize either the boresight error slope or its effect on missile guidance. These include:

a. Reducing guidance loop gain or increasing guidance time constant. This compromises guidance accuracy.

b. Controlling radome wall thickness during the fabrication process by machine grinding or forming. This is expensive, time consuming, and usually yields a boresight error slope greater than about 0.06 degrees per degree.

c. Preflight mapping the boresight errors, storing these errors in a look-up table and actively compensating for the errors during flight. Although residual errors after compensation have been measured as low as 0.01 deg/deg this is very expensive since each radome must be individually mapped. Also, this does not compensate for inflight variation of errors.

d. Opening the guidance loop and introducing a known dither, in both pitch and yaw, of the body axis about the velocity vector while the seeker is still tracking the target. The measured LOS rate is then compared with that expected from the known dither rate to obtain the LOS rate error. This technique may introduce oscillation into an otherwise marginally stable missile. It takes considerable time and energy because of the two-axis dither. The dither is necessarily slow because of missile response time; therefore the data may not be in real time for hypersonic flight where the radome statistics are changing rapidly. This method has never been tested.

It has been found that for supersonic flight at high altitude with low aerodynamic q, a boresight error slope (m)<0.01 deg/deg is required to prevent the parasitic loop from causing the missile to go unstable. Thus the foregoing approaches to reducing m may not be satisfactory.

2.0 OBJECTS AND ADVANTAGES

The real time boresight error slope sensor described herein is an inexpensive device capable of reducing the line-of-sight rate errors contributed by the radome or IR dome in real time from whatever the cause. The various sources of nonzero m include those arising from aerodynamic heating from supersonic or hypersonic flight such as ablation, plasma, char and erosion, as well as those from external sources such as frequency agility or irradation by a high energy laser. This is accomplished in real time which is necessary if the dome statistic are time varying.

3.0 DRAWING FIGURES

FIG. 1 shows the nonlinearity of three characteristic curves for three different look angles.

FIG. 2 is a functional block diagram of the antenna beam dither generator.

FIG. 3 is a functional block diagram of the boresight error slope sensor with a scale factor (AGC) correction loop.

4.0 PHYSICAL PRINCIPLE

During a research program to employ a microwave RF (radio frequency) seeker in a hypersonic missile, this inventor discovered that the curvature of the seeker open loop transfer characteristic (i.e. output voltage vs. look angle measured from electrical boresight) was proportional to the boresight error slope. The pertinent results of this research are shown in FIG. 1. Curve 1 shows that the transfer characteristic is slightly curved upward (concave) at a look angle of 1 deg off the nose where the boresight error slope m, was found to be +0.05 deg/deg. Curve 2 shows that the transfer characteristic is a straight line at an LOS=7 deg where m=0. Curve 3 shows that the transfer characteristic is dramatically curved downward (convex) at 15 deg where m=−0.12 deg/deg.

Although the research was performed at RF it is reasonable to assume that the relationship between boresight error slope and transfer characteristic nonlinearity is not frequency dependent. Accordingly the physical principle of this invention applies to infra-red (IR) as well as RF seekers. However, only the boresight error slope of an RF seeker with a gimballed phase monopulse antenna or a phase interferometer will be described.

If the antenna beam is caused to dither intermittently at a rate too great for the tracking loop to respond, then the seeker tracking loop is open insofar as the dither is concerned. However the normal tracking loop is left unperturbed. The real time sensed seeker output voltage vs. look angle TCR can then be determined, without interfering with normal tracking.

There are three properties of the transfer characteristic which are pertinent to this patent. First the transfer characteristic (TC) may be a straight line with any slope (not to be confused with boresight error slope) but with the null shifted away from antenna array normal. The amount the electrical null is shifted from array normal is the boresight error and can not be sensed by the device described herein. Second the slope of the TC is a measure of tracking loop gain and is sensed in this device. Third, the nonlinearity of the TC in the neighborhood of the LOS is a measure of the boresight error slope. This is also sensed by this device and is the key to this invention. The magnitude and sense of the boresight error slope are proportional to the magnitude and sense respectively of the transfer characteristic nonlinearity in the neighborhood of the line of sight.

5.0 FUNCTIONAL DESCRIPTION

Two identical channels (pitch and yaw) are required. Only the pitch channel will be described.

5.1 Beam Dither Generator

Refer to FIG. 2. A pulsed sawtooth dither waveform generator 4 generates a sawtooth voltage waveform $V_D(t)$ with the following parameters:

-A28-

(a) Duty Factor: $DF = 0.1$

(b) Pulse repetition frequency: $PRF = 100$ pps

(c) Pulse duration: $\tau = 1$ ms.

(e) Sawtooth frequency $f_c = 10$ KHz

(f) Pulse repetition interval $T = \frac{1}{PRF} = 0.01$ sec

Values of the foregoing parameters can be justified for the following reasons:

a. Duty Factor: A dither duty factor (DF) no greater than about 10% is required so that no perturbation exists for approximately 90% of the time, thus leaving the normal tracking loop virtually unperturbed.

b. PRF: A PRF much greater than the normal tracking loop bandwidth, typically 5 to 10 Hz, is required, again so that the normal tracking loop cannot respond to the perturbations. Thus, a dither PRF=100 pps appears reasonable.

c. Pulsewidth: The pulsewidth from items a and b is

$$\tau = \frac{DF}{PRF} = 1.0 \text{ ms.}$$

d. Carrier Frequency: Approximately 10 cycles are desired in order to yield good average values when the result is averaged over one pulsewidth. Thus, a dither carrier frequency of

$$f_c = \frac{N}{\tau} = \frac{10}{1 \times 10^{-3}} = 10 \text{ KHz}$$

appears reasonable.

e Amplitude: The peak value of the waveform is chosen to shift the beam±0.5 beamwidths about the nominal electrical boresight axis.

The output voltage $V_D(t)$ from the dither waveform generator (4) is coupled to an adder 6 via a shielded conductor 5. This voltage is added to V_m which is coupled to the adder 6 on a shielded conductor 7 from the boresight error slope computer 27, described later. The sum $V_S(t)$ is applied to the dither phase shifter 9 via a shielded conductor 8. The dither phase shifter 9 can be either an analog phase shifter (ferrite) or digital (PIN diodes). An analog phase shifter is used here. The dither phase shifter 9 is in one arm B of a phase monopulse antenna 10. RF is fed from subarray B of antenna 10 to the dither phase shifter 9 via waveguide 11. The output of the dither phase shifter 9 is coupled to the magic T 13 via waveguide 12. RF from subarray A of antenna 10 is fed to the magic T 13 on waveguide 14.

The magic T 13 forms the complex sum, (Σ), and complex difference, (Δ), of the two RF voltages on waveguide 12 and 14. These are fed to the Σ and Δ mixers (not shown) on waveguides 15 and 16 respectively where they are converted to ΣIF and ΔIF, respectively.

The antenna beam center 17 is caused to dither with respect to array normal 18 in accordance with the sawtooth waveform $V_D(t)$.

It is inertialess scanning and can be as rapid as we please, even 10,000 times per second (f_c=10 KHz).

5.2 Boresight Error Slope Sensor

The boresight error slope sensor is implemented as two feedback loops. The first is the boresight error slope correction loop. It is a phase correction loop with the dither phase shifter 9 (FIG. 2) as the follow-up device since the antenna is a phase monopulse antenna. If the seeker were an IR sensor, the boresight error slope correction could be implemented with an open loop computation. The second loop is an AGC (automatic gain control) loop to correct for scale factor error.

Refer to FIG. 3. The boresight error slope sensor requires two inputs from the seeker receiver. The first is the antenna servo output usually low-pass filtered to about 10 Hz. This is denoted by ε(t) and is a voltage proportional to the angle of the LOS from electrical boresight. It is sometimes called the dynamic lag. ε(t) is coupled to the boresight error slope sensor on a shielded conductor 19. The second input is the video from the ratio detector which forms the ratio Re

$$\left[\frac{\Delta}{\Sigma}\right].$$

The video is usually pulses for a pulsed radar, although other types of wide bandwidth signals such as those received from passive IR or cw jammers, may be accepted. This wide band video is coupled to the boresight error slope sensor via coax cable 20.

(a) Boresight Error Slope Correction Loop

If the LOS is at electrical boresight the receiver difference channel IF, (i.e. ΔIF) is zero and the voltage on coax 20 is zero. If the LOS is within the Σ beamwidth (i.e. FOV) but not at boresight the ratio detector output on coax 20 is proportional to the LOS angle off boresight. This differs from ε(t) on 19 in that ε(t) is low pass filtered to about 10 Hz whereas Re

$$\left[\frac{\Delta}{\Sigma}\right]$$

on 20 is wide band video (of the order of a few MHz).

The received video on coax 20 and the dynamic lag ε(t) on shielded cable 19 are processed in a signal processor comprised of the sample-and-hold circuit 21 and a coincidence detector 22. For a pulsed radar there must be at least one sample per pulse. Alternatively, the sampling rate (Nyguist Sampling Theorem) must be at least twice the information bandwidth, or two samples per cycle of information. This sample is held for the received pulse repetition interval. The sample rate and the bold period are set by the associated radar parameters. With the sample rate and the hold duration properly chosen and the beam dithering, the output voltage on conductor 23 is a time varying voltage denoted by $V_{DR}(t)$, the instantaneous value of which is proportional to the angle between the Δ pattern beam null and the LOS. $V_{DR}(t)$ is compared in the coincidence detector 22 with the lag voltage Kε(t) on conductor 24. K is the gain of the AGC amplifier 25. At the instant $V_{DR}(t)$=K ε(t) the output of the coincidence detector on conductor 26 is a delta function or unit impulse δ(LOS). The time of occurance of 6(LOS) is the time the signal $V_{DR}(t)$ received as a result of the rapid antenna beam dither (open loop) equals the low pass filtered voltage Kε(t) of the tracking loop (closed loop).

The unit impulse δ(LOS) on conductor 26 is fed to the boresight error slope computer 27 along with the voltage $V_{DR}(t)$ on conductor 23 from the sample-and-hold 21. Recall that $V_{DR}(t)$ is the rapidly time varying received voltage resulting from antenna dither. This voltage $V_{DR}(t)$ is sampled in the boresight error slope computer 27 by the unit impulse δ(LOS) to yield a voltage V_{DR}(LOS). This is the value of the voltage $V_{DR}(t)$ at the instant the antenna beam or field-of-view is at the position it would be if the beam were not dithering and the tracking loop were closed. In other words the value of the transfer characteristic at the LOS has been obtained, and without disturbing the tracking loop.

Now the value of the transfer characteristic a small angle either side of LOS is desired. This is obtained from a unit impulse occuring at LOS±Δt from the clock in the dither waveform generator 4 and coupled to the boresight error slope computer 27 via conductor 28. Note that the unit impulse δ(LOS) on conductor 26 is also fed to the dither waveform generator 4. Thus a small increment of time Δt is added to or subtracted from the time of occurance of δ(LOS) to yield δ(LOSγΔθ). This holds since the dither waveform is a sawtooth, hence the angular excursions of the antenna beam or field of-view are linear functions of time. Therefore a voltage V_{DR}(LOS±Δθ) is generated by sampling $V_{DR}(t)$ with the delta function δ(LOS±Δθ). In other words the value of the transfer characteristic at LOS±Δθ in the neighborhood of the line of sight has been obtained. A boresight error slope correction voltage V_m is now formed in the boresight error slope computer 27 from the relation

$$V_m=[V_{DR}(LOS+\Delta\theta)-V_{DR}(LOS)]-[V_{DR}(LOS)-V_{DR}(LOS\Delta\theta)]$$

Notice that if the transfer characteristic is a straight line, the two terms in brackets are equal and V_m=0. Thus this "second difference" method yields a correction voltage V_m proportional to the nonlinearity of the transfer characteristic. And this was shown in FIG. 1 and Section 4.0 to be proportional to the boresight error slope. V_m is fed to the adder 6, FIG. 2, via shielded cable 7. A voltage proportional to body rate $\dot{\theta}$ is fed to the boresight error slope computer 27 on shielded cable 29 to determine the sense of V_m. The boresight error slope correction loop is now complete.

(b) AGC Loop (Scale Factor Correction Loop)

An automatic gain control (AGC) or scale factor correction voltage is generated in the AGC computer 30 in much the same manner as the boresight error slope correction voltage V_m was generated.

The voltage $V_{DR}(t)$, the instantaneous value of which is proportional to the angle of the Δ null from LOS, is fed to the AGC computer 30 from the sample-and-hold 21 via conductor 23. Also fed to the AGC computer 30 is the unit impulse δ(LOS) from the coincidence detector 22 via conductor 26. δ(LOS) samples $V_{DR}(t)$ to form a voltage V_{DR} (LOS) just as was done in the boresight error slope computer. Now the value of the transfer characteristic a small angle either side of LOS V_{DR}(LOS±Δθ) is also generated in the AGC computer 30 by sampling $V_{DR}(t)$ by a delta function δ(LOSγΔθ) fed to the AGC computer 30 from the dither waveform generator 4 via conductor 31 just as was done in the boresight error slope computer. In fact the voltage V_{DR}(LOS) and V_{DR}(LOS±Δθ) generated in the boresight error slope computer 27 could be used in the AGC computer 30.

Here the similarity ends. The AGC loop depends upon the difference between the voltages from the actual received transfer characteristic TCR and the corresponding voltages from the ideal transfer characteristic TCA. Since the dither driving function is a sawtooth, the instantaneous angle of the antenna A pattern from the array normal is linearly proportional to the dither voltage $V_D(t)$. Accordingly the dither voltage $V_D(t)$, coupled to the AGC computer via conductor 32, is sampled by δ(LOS) and δ(LOSγΔθ) to yield V_D(LOS) and V_D(LOSγΔθ) respectively from the ideal transfer characteristic. An AGC correction voltage V_{AGC} is then generated from the relation.

$$V_{AGC}=[V_{DR}(LOS+\Delta\theta)-V_{DR}(LOS)]-[V_D(LOS\pm\Delta\theta)-V_D(LOS)]$$

If the two voltages in brackes are equal, the AGC voltage is zero and the open loop transfer characteristic TCR coincides with the ideal transfer characteristic TCA. The AGC voltage V_{AGC} is applied to the AGC amplifier 25 via conductor 33 to control the gain of the AGC amplifier 25, thereby yielding a better estimate of ε(t) on conductor 24 than would otherwise be available. The output of the AGC amplifier 25 is fed to the autopilot via conductor 34.

6.0 CONCLUSION

It is concluded that the REAL TIME BORESIGHT ERROR SLOPE SENSOR described herein can sense and reduce the boresight error slope in real time from whatever the cause of nonzero slope. These include high temperature gradients from aerodynamic heating, frequency agility, ablation, plasma, char, erosion, and irradiation by a high energy laser.

Since the boresight error slope is sensed by measuring the curvature of the seeker open loop transfer characteristic, the technique is independent of carrier frequency. Accordingly this patent applies to infra-red (IR) seekers as well as radio frequency (RF) seekers.

GLOSSARY (U)

LOS Line of sight

m boresight error slope

$\dot{\theta}$ body rate

$\Delta\dot{\theta}$ error in line-of-sight rate

RF Radio frequency

IR Infra-red

TC Transfer characteristic (seeker output voltage vs look angle relative to electrical null

TCR Received transfer characteristic

TCI Ideal transfer characteristic

DF Duty factor

PRF Pulse repetition frequency

T Pulse duration

f_c Sawtooth frequency

T Pulse repetition interval

$$T=\frac{1}{PRF}$$

N Number of cycles f_c during τ, ($N=f_c\tau$)

$V_D(t)$ Voltage output of dither waveform generator

V_m Voltage output of m computer

$V_S(t)$ $V_D(t)+V_m$

ε(t) Antenna servo dynamic lag

RE

$$\left[\frac{\Delta}{\Sigma}\right]$$

Ratio detector output

Σ Antenna sum pattern or sum voltage

Δ Antenna difference pattern or Δ voltage

$V_{DR}(t)$ Voltage output of sample and hold

δ(χ) Unit impulse occuring at χ

t running time

Δt small increment in time

-A30-

V_m Voltage proportional to boresight error slope

V_{AGC} Voltage proportional to difference in slope of ideal transfer characteristic and measured transfer characteristic

I claim:

1. A boresight error slope reduction system for sensing, in real time, a boresight error slope in a homing seeker, said system comprising:

(a) a seeker having a steerable field-of-view, said field-of-view having an electrical boresight axis, and

(b) a receiver wherein a wide bandwidth video signal voltage is obtained when an object is within said field-of-view, said object being on a line-of-sight from said seeker causing an included angle between said line-of-sight and said boresight axis, said video signal voltage being a function of said included angle, and

(c) a tracking loop having a means for using said signal voltage to steer said field-of-view so that said object remains within said field-of-view and a means for generating a low-pass filtered dynamic lag voltage from said video signal voltage, and

(d) a dither waveform generator wherein a dither voltage is generated and

(e) a means for using said dither voltage to cause a dither of said boresight axis and

(f) a means for causing said tracking loop to be open during said dither of said boresight axis and

(g) a boresight error slope computer circuit for generating a transfer characteristic having a measurable curvature, said transfer characteristic being a voltage functionally related to said included angle, said angle resulting from said dither, and

(h) a boresight error slope computer circuit for generating a correction voltage, said correction voltage being a function of said curvature of said transfer characteristic in a neighborhood of said line of sight, and

(i) an additive means for using said correction voltage to reduce said boresight error slope.

2. The boresight error slope reduction system of claim 1 wherein said tracking loop includes an automatic gain control amplifier and an automatic gain control computer, said automatic gain control computer comprising:

(a) a transfer characteristic sample-and-hold circuit for obtaining two samples of said transfer characteristic, a first sample being obtained at a first instant, said first instant being the instant of coincidence between said wide bandwidth video signal voltage and said low-pass filtered dynamic lag voltage, and a second sample being obtained at a second instant, said second instant being at a different time from said first instant, and

(b) a signal subtracter circuit for generating a direct current signal voltage by subtracting said first sample of said transfer characteristic from said second sample of said transfer characteristic and

(c) a dither sample-and-hold circuit for obtaining two samples of said dither voltage, a first sample of said dither voltage being obtained at said first instant and a second sample of said dither voltage being obtained at said second instant, and

(d) a dither subtracter circuit for generating a direct current reference voltage by subtracting said first sample of said dither voltage from said second sample of said dither voltage and

(e) an automatic gain control subtracter circuit for generating an automatic gain control voltage by subtracting said direct current reference voltage from said direct current signal voltage and

(f) a means for applying said automatic gain control voltage to said automatic gain control amplifier.

3. The boresight error slope reduction system of claim 1 wherein said seeker is a radio frequency seeker having a phase sensing monopulse antenna and said additive means is a phase shifter.

4. The boresight error slope reduction system of claim 1 wherein said seeker is an infra-red seeker and said additive means is an adder circuit for adding said correction voltage to said dynamic lag voltage.

* * * * *

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P.O. Box 1450
Alexandria, VA 22313-1450
www.uspto.gov

EXHIBIT 7

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OFFICE OF PETITIONS

Paper No. 34

ALTON B. HORNBACK
5650 BLOCH ST.
SAN DIEGO, CA 92122

In re Patent No. 6,079,666	:	LETTER RE PROPOSED
Issue Date: June 27, 2000	:	CERTIFICATE OF CORRECTION
Application No. 06/859,033	:	AND
Filed: April 25, 1986	:	INFORMATION TO CORRECT
Patentee: Alton B. Hornback	:	A PATENT

This letter is in response to a correspondence received May 29, 2007[1] to the U.S. Patent and Trademark Office (Office), which request the Office to "reissue"[2] U.S. Patent No. 6,079,666. The request alleges numerous errors in the printing of the specification of the patent, including purported errors in the specification and claims, referenced as Enclosures 2 and 4 in the May 29, 2007 letter. The purpose of this communication mailed pursuant to 35 U.S.C. § 254 and 37 CFR 1.322(a)(4), is to afford the patentee of the above-identified patent an opportunity to be heard on the matter discussed *infra* and to provide the patentee with information regarding corrections of patents.

A TIME LIMIT OF ONE MONTH FROM THIS MAILING IS SET FOR ANY REPLY TO THIS COMMUNICATION. NO EXTENSIONS OF TIME UNDER 37 CFR 1.136(a) OR (b) ARE AVAILABLE. IF NO REPLY IS RECEIVED WITHIN THE AFOREMETIONED TIME PERIOD, THE MATTER WILL BE DECIDED ON THE RECORD.

Statutes and Regulations

35 U.S.C. 154 Contents and term of patent; provisional rights.

(a) . . .
(4) SPECIFICATION AND DRAWING. —A copy of the specification and drawing shall be annexed to the patent and be a part of such patent.

35 U.S.C. 254 Certificate of correction of Patent and Trademark Office mistake.

Whenever a mistake in a patent, incurred through the fault of the Patent and Trademark Office, is clearly disclosed by the records of the Office, the Director may issue a certificate of correction stating the fact and nature of such mistake, under seal, without charge, to be recorded in the records of patents. A printed copy thereof shall be attached to each printed copy of the patent, and such

[1] The letter is dated May 25, 2007.
[2] The Office assumes the patentee is requesting a corrected patent when he asked the Office to "[r]eissue Patent No. 6,079,666, Pursuant to 35 U.S.C. 131[.]"

certificate shall be considered as part of the original patent. Every such patent, together with such certificate, shall have the same effect and operation in law on the trial of actions for causes thereafter arising as if the same had been originally issued in such corrected form. The Director may issue a corrected patent without charge in lieu of and with like effect as a certificate of correction.

37 CFR 1.322 Certificate of correction of Office mistake.

(a)(1)The Director may issue a certificate of correction pursuant to 35 U.S.C. 254 to correct a mistake in a patent, incurred through the fault of the Office, which mistake is clearly disclosed in the records of the Office:

(i) At the request of the patentee or the patentee's assignee;

. . .

(4) The Office will not issue a certificate of correction under this section without first notifying the patentee (including any assignee of record) at the correspondence address of record as specified in § 1.33(a) and affording the patentee or an assignee an opportunity to be heard.

(b) If the nature of the mistake on the part of the Office is such that a certificate of correction is deemed inappropriate in form, the Director may issue a corrected patent in lieu thereof as a more appropriate form for certificate of correction, without expense to the patentee.

Intent to Issue a Certificate of Correction

As 35 U.S.C. § 254 and 37 CFR 1.322 set forth, the Director may issue a certificate of correction whenever a mistake in a patent, incurred through the fault of the Office, is clearly disclosed by the records of the Office. The patent, together with such certificate of correction (COC), shall have the same effect and operation in law as if the same had been originally issued in such corrected form. If the nature of the mistake on the part of the Office is such that a COC is deemed inappropriate in form, the Director may issue a corrected patent.

Upon review of the record, a certificate of correction, not a corrected patent, should be issued. The mistakes requested to be corrected found in Enclosure 2 are clerical or typographical in nature and are precisely the type of errors intended for a COC. Moreover, the errors found in Enclosure 2 are not gross or so numerous that a COC is deemed inappropriate in form. Thus, while the Director has the discretion to issue a corrected patent in lieu of a COC, the nature of the mistakes on the part of the Office with respect to the above-identified patent is such that a COC is deemed more appropriate. Additionally, a COC can be printed in a shorter amount of time than a corrected patent.

Both the patentee and the government have agreed that that the mistakes found in Enclosure 2 were errors. These changes also match with those found in Enclosure 3 of the May 29, 2007 letter. The Office also acknowledges such errors. The Office intends to correct many of these mistakes. However, some of these mistakes will not be corrected by the COC. With the exception of 35 U.S.C. § 154 requiring a copy of the specification be annexed to and be a part of the patent, there is no law or regulation with respect to how the patent will be printed. Thus, the Office was not required to print the specification of U.S. Patent No. 6,079,666 in any particular format. Granted, the Office attempted to present the specification of U.S. Patent No. 6,079,666, as written, including the same line spacing or formatting of the Glossary, but was under no obligation to print the specification exactly as presented by the applicant.

Therefore, pursuant to 37 CFR 1.322, the Office intends to issue the attached certificate of correction. The COC will not correct the following errors: (1) removing the paragraph breaks in column 3, line 60, column 4, lines 18 and 35, and column 6, line 43; (2) the line spacing at column 3, line 62, column 4, line 23, and column 5, line 34; or (3) the formatting errors relating to spacing and formatting in column 6, lines 27 through 67. Please review the Certificate of Correction. As stated above, if no reply is received, the matter will be decided on the record.

The USPTO regrets the error and the inconvenience.

Options to Correct Other Alleged Errors

Petitioner also alleges "the printed claims were not the allowed claims." As stated previously, the Director may issue a COC whenever a mistake in a patent, incurred through the fault of the Office, is clearly disclosed by the records of the Office. With respect to the alleged errors in the printed claims and as referenced in Enclosure 4, patentee has not shown to the satisfaction of the Director that the claims in the above-identified patent were mistakenly printed, were the fault of the Office, or are clearly disclosed in the Office's records.

Upon review of the record, there is insufficient evidence to show the claims printed in U.S. Patent No. 6,079,666 were an error or mistake incurred through the fault of the Office. First, while petitioner has provided the Office with Enclosure 4, he has not pointed out the purported errors in the printing of the claims, such as the column and line number in the printed patent where text should be corrected. Second, the papers included with Enclosure 4 do not appear to be part of the official record. For example, the UNCLASSIFIED stamp and the annotations D000322-D000326 in the lower right-hand corner do not appear in the Office's record. Thus, they are not evidence of the amendments submitted to the Office in May 1987. Third, the government has not agreed to that there were errors in the printed claims. Fourth, the Office appears to have two different copies of the Amendment A received May 4, 1987[3]. A first copy contains five pages having claims 3 through 6 and stamped "Licensing and Review DECLASSIFIED." This copy includes the substance of the claims printed in U.S. Patent No. 6,079,666. A second copy also appears to contain five pages having claims 3 through 6 but has claim language seemingly matching the contents of Enclosure 4. As such, the official record does not clearly indicate that the error in printing the claims of U.S. Patent No. 6,079,666 was entirely the fault of the Office and may indicate that the petitioner contributed to the purported error in printing the wrong claims in the patent.

For the above reasons, the requested corrections to the patent with respect to the claims will not be included in the attached certificate of correction and will not be treated at this time.

Nevertheless, if the patentee maintains that the error in printing the claims was the fault of the Office or if patentee wishes to request any other corrections, it is strongly advised that the text of the

[3] The amendment is dated May 1, 1987.

correction requested be submitted on a Certificate of Correction form, PTO/SB/44. A blank courtesy copy of PTO/SB/44 has been enclosed for your convenience. The location of the error in the printed patent should be identified on form PTO/SB/44 by column and line number or claim and line number. A request for a Certificate of Correction should be addressed to:

ATTN: Certificate of Correction Branch
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

In addition, please refer to the enclosed copies of §§ 1480, 1481 and 1485 of the Manual of Patent Examining Procedure (MPEP) for the preparation and submission of a request for a Certificate of Correction.

If the petitioner determines the error in printing the claims or other errors were the applicant's mistake, any such request should be in the form of a Certificate of Correction submitted under 37 CFR 1.323 and include a $100 processing fee. Direct such requests to the above address.

As an alternative, petitioner may also consider filing a reissue application. The provisions of 35 U.S.C. § 251 permit the reissue of a patent to correct an error in the patent made without any deceptive intention. In accordance with 35 U.S.C. § 251, the error upon which a reissue is based must be one which causes the patent to be "deemed wholly or partly inoperative or invalid, by reason of a defective specification or drawing, or by reason of the patentee claiming more or less than he had a right to claim in the patent." There must be at least one error in the patent to provide grounds for reissue of the patent. If there is no error in the patent, the patent will not be reissued. When the original application was filed before December 8, 2004, the basic filing fee for a reissue application is $790 (or $395 for small entity). Enclosed is MPEP 1402 for your consideration.

Employ Services of Attorney or Agent

An examination of this file reveals that patentee is unfamiliar with patent prosecution procedure. Lack of skill in this field usually acts as a liability in affording the maximum protection for the invention disclosed. Patentee is advised to secure the services of a registered patent attorney or agent to handle the above matters, since the value of a patent is largely dependent upon skilled preparation and prosecution. The Office cannot aid in selecting an attorney or agent.

A listing of registered patent attorneys and agents is available on the USPTO Internet web site http://www.uspto.gov in the Site Index under "Agents and Attorney Roster, Patent." Applicants may also obtain a list of registered patent attorneys and agents located in their area by writing to the Mail Stop OED, Director of the U.S. Patent and Trademark Office, P.O. Box 1450, Alexandria, VA 22313-1450.

Summary

Patentee is given ONE MONTH from the mailing of this letter to reply to this communication. In particular, the Office intends to issue a certificate of correction, as discussed in the above section, entitled, "Intent to Issue a Certificate of Correction," and as attached hereto. Also, as stated previously, if no reply is received within the time limit, the matter will be decided on the record.

Further correspondence with respect to this letter should be addressed as follows:

By Mail: Mail Stop PETITIONS
Commissioner for Patents
Post Office Box 1450
Alexandria, VA 22313-1450

The centralized location for hand-carried correspondence is the Customer Window located at:

Customer Service Window
Mail Stop Petitions
Randolph Building
401 Dulany Street
Alexandria, VA 22314

The centralized facsimile number is (571) 273-8300.

Telephone inquiries concerning this decision should be directed to Denise Pothier at (571) 272-4787.

Brian Hearn
Petitions Examiner
Office of Petitions

enc: completed Certificate of Correction (PTO/SB/44) for U.S. Patent No. 6,079,666
blank Certificate of Correction form (PTO/SB/44)
MPEP §§ 1402, 1480, 1481, 1485

ALTON B. HORNBACK
5650 Bloch Street
San Diego, CA 92122
(858) 453-3334
2 August 2007

EXHIBIT 8

Mail Stop PETITIONS
Commissioner for Patents
Post Office Box 1450
Alexandria, VA 22313-1450

Attn: Brian Hearn

Subject: Amended Petition to Reissue Patent No. 6,079,666 so that it Conforms to Allowed Patent Application No. 06/859,033, Filed: 25 April 1986; Issued: 27 June 2000.

Sir:

This letter, together with five Enclosures and two Attachments, constitutes a reply to your letter of 25 July 2007, Re: Reissue of subject patent so that it conforms to allowed patent application.

Enclosure 1 is a copy of Patent No. 6,079,666. Enclosure 2 is a copy of allowed Patent Application No. 06/859,033, less allowed Claims 3-6 (now, 1-4). Enclosure 3 is a copy of "SUPPLEMENTAL Amendment A CLASSIFIED ANNEX", which was mailed 6 May 1987 and contained Amended Claims 3-6; that SUPPLEMENTAL Amendment A was stamped by the PTO as "RECEIVED May 11 1987 GROUP 220 LICENSING & REVIEW". Enclosure 4 is a copy of a PTO communication which shows that, on 5/11/87, the PTO filed that communication, and thereafter, on 05-27-87 (Id., at 2) allowed Claims 3-6.

Attachment 1, included in your letter of 25 July 2007, is a copy of the errors in the patent specifications which the PTO, itself, has certified must be corrected so that Patent No. 6,079,666 conforms to Patent Application No. 06/859,033. To that end, in your letter at 3, you stated: "Therefore, pursuant to 37 CFR 1.322, the Office intends to issue the attached certificate of correction. ... The USPTO regrets the error and inconvenience".

Attachment 2 is a copy of the errors in the patent claims which must be corrected so that the patent conforms to the application.

From the above, Petitioner submits that: (i) those errors were, without exception, the fault of the PTO; (ii) the nature and extent of those errors are such that a "Certificate of Correction" is clearly inappropriate in form; and (iii) the invention described in the issued patent is not the same invention as that disclosed in the allowed patent application, and therefore, the PTO should either issue a new patent pursuant to 35 U.S.C. 131, or a corrected patent pursuant to 37 CFR 1.322(b).

Alternatively, if the PTO can show that any error in either the patent specifications or patent claims is the fault of Petitioner, then it should do so, and reissue the corrected patent pursuant to 35 U.S.C. 251, quality control and the above-noted apology for the inconvenience to Petitioner, notwithstanding. In that unlikely event, Petitioner has enclosed a check (Enclosure 5) in the amount of $395.00 as the required "small entity" reissue fee.

Respectfully submitted.

Alton B. Hornback

Alton B. Hornback, Petitioner

Attachments: 2 as noted.
Enclosures: 5 as noted.

UNITED STATES PATENT AND TRADEMARK OFFICE

CERTIFICATE OF CORRECTION

PATENT NO. : 6,079,666
APPLICATION NO.: 06/859,033
DATED : June 27, 2000
INVENTOR(S) : Alton B. Hornback

ATTACHMENT 1.

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

In the specification, column 2, line 2, "statistic" should read -- statistics --;

Column 3, line 7, "(e)" should read – (d) --;

Column 3, line 9, "(f)" should read – (e) --;

Column 4, line 12, cancel the text, "Re";

Column 4, line 14, "$\left[\frac{\Delta}{\Sigma}\right]$." should read -- Re$\left[\frac{\Delta}{\Sigma}\right]$. --;

Column 4, line 30, cancel the text, "Re";

Column 4, line 32, "$\left[\frac{\Delta}{\Sigma}\right]$" should read – Re$\left[\frac{\Delta}{\Sigma}\right]$ --;

Column 4, line 55, "6(LOS)" should read – δ(LOS) --;

Column 5, lines 12, 49, and 63, for each occurrence, "δ(LOSγΔθ)" should read -- δ(LOS±Δθ) --;

Column 5, line 22, after "V_m", insert -- = -- and "V_{DR}(LOSΔθ)" should read -- V_{DR}(LOS-Δθ) --;

Column 5, line 64, "V_D(LOSγΔθ)" should read -- V_D(LOS±Δθ) --;

Column 5, line 68, after "V_{AGC}" insert -- = -- and "V_{DR}(LOS+Δθ)" should read -- V_{DR}(LOS±Δθ) --;

Column 6, line 30, "θ" should read – β --;

Column 6, line 40, "T" should read – τ --; and

Column 6, line 54, cancel the text, "RE";

Column 6, line 57, "$\left[\frac{\Delta}{\Sigma}\right]$" should read -- Re$\left[\frac{\Delta}{\Sigma}\right]$ ~~Radio~~ Ratio detector output --; and

Column 6, line 60, cancel the text, "~~Radio d~~ Ratio etector output".

ATTACHMENT 2

PTO/SB/44 (06-07)
Approved for use through 06/30/2007. OMB 0651-0033
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.
(Also Form PTO-1050)

UNITED STATES PATENT AND TRADEMARK OFFICE
CERTIFICATE OF CORRECTION

Page 1 of 1

PATENT NO. : 6,079,666
APPLICATION NO.: 08/859,033
ISSUE DATE : June 27, 2000
INVENTOR(S) : ALTON B. HORNBACK

It is certified that an error appears or errors appear in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

ERRORS IN PATENT CLAIMS

Column 7

Line 11. Delete "wide bandwidth".

Line 14. After "seeker" add -- thereby --.

Line 17. After "said" add -- video --.

Line 18. After "to" add -- generate a filtered dynamic lag voltage, said dynamic lag voltage being used --.

Line 19. After "field-of-view" add -- , --.

Line 19-20. Delete "a means for generating a low-pass filtered dynamic lag voltage from said video signal voltage, and".

Column 8

Line 7. Delete "wide bandwidth".

Line 7. Delete "low-pass".

MAILING ADDRESS OF SENDER (Please do not use customer number below):

ALTON B. HORNBACK
5650 BLOCH ST.
SAN DIEGO, CA 92122

This collection of information is required by 37 CFR 1.322, 1.323, and 1.324. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1.0 hour to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: **Attention Certificate of Corrections Branch, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

UNITED STATES DEPARTMENT OF COMMERCE
Patent and Trademark Office
ASSISTANT SECRETARY OF COMMERCE AND
COMMISSIONER OF PATENTS AND TRADEMARKS
Washington, D.C. 20231

January 8, 2008

EXHIBIT 9

Patent No.: 6,079,666
Applicant : Alton B. Hornback
Issued : June 27, 2000
For : **REAL TIME BORESIGHT ERROR SLOPE SENSOR**

Re: Request for Certificate of Correction

Consideration has been given your request for the issuance of a certificate of correction for the above-identified patent received in the August 6, 2007.

The errors requested to be corrected in the claims will not be entered. The broadening of claims may affect patentability of claims.

In view of the foregoing, your request in this matter is hereby denied.

A certificate of correction will be issued to correct the remaining errors in your request.

Further correspondence concerning this matter should be filed and directed to Decisions and Certificates of Correction Branch.

For Mary F. Diggs
Decisions & Certificates
of Correction Branch
(703) 308-9390 ext. 125

ALTON B. HORNBACK
5650 BLOCH STREET
SAN DIEGO CA 92122

AJ

UNCLASSIFIED

EXHIBIT 10

In the United States Patent and Trademark Office

Serial Nr.: 06/859,033

Filed: 04/25/1986

Inventor(s): ALTON B. HORNBACK

Title: REAL TIME BORESIGHT ERROR SLOPE SENSOR

Examiner and G.A.U.: CHARLES T. JORDAN/GAU 221

Amendment A

CLASSIFIED ANNEX

Date: 1 May 1987

Commissioner of Patents and Trademarks
Washington, District of Columbia 20231

Sir:

In response to the Office Letter mailed 02/20 1987, please amend the above application as follows:

RECEIVED
GROUP 220
MAY
LICENSING & REVIEW

Original classification authority:
DOD 5200.1-R/AFR 205-1, "Information Security Program Regulation", and IAW DOD 5200.1-H/AFR 205-37.

Agency and office or origin:
Air Force Armament Laboratory/DLM (AD)
Eglin AFB FL 32542

Contract No. IRAD 111182	☐ Review For Declassification	☐ Declassify On 15 OCT 99	
Classified by AFAL/DLM (AD) EGLIN AFB	☐ Downgrade To	On	

-AA2-

CLASSIFIED ANNEX

Date: 1/7/a/87

Commissioner of Patents and Trademarks
Washington, District of Columbia 20231

Sir:

In response to the Office Letter mailed 02/20, 1987, please amend the above application as follows:

RECEIVED
GROUP 220

LICENSING & REVIEW

Original classification authority:
DOD 5200.1-R/AFR 205-1, "Information Security Program Regulation", and IAW DOD 5200.1-H/AFR 205-37.

Agency and office or origin:
Air Force Armament Laboratory/DLM (AD)
Eglin AFB FL 32542

Contract No. IRAD 111182	☐ Review For Declassification	☐ Declassify On 15 OCT 99	
Classified by AFAL/DLM (AD) EGLIN AFB		☐ Downgrade To	On

- A42a -

(U) Claims:

(U) Claim 1, cancel and rewrite as new claim 3 as follows:

(C) 3. A boresight error slope reduction system for sensing, in real time, a boresight error slope in a homing seeker, said system comprising:

(U) (a) a seeker having a steerable field-of-view, said field-of-view having an electrical boresight axis, and

(U) (b) a receiver wherein a wide bandwidth video signal voltage is obtained when an object is within said field-of-view, said object being on a line-of-sight from said seeker causing an included angle between said line-of-sight and said boresight axis, said video signal voltage being a function of said included angle, and

(U) (c) a tracking loop having a means for using said signal voltage to steer said field-of-view so that said object remains within said field-of-view and a means for generating a low-pass filtered dynamic lag voltage from said video signal voltage, and

(U) (d) a dither waveform generator wherein a dither voltage is generated and

(U) (a) a seeker having a steerable field-of-view, said field-of-view having an electrical boresight axis, and

(U) (b) a receiver wherein a wide bandwidth video signal voltage is obtained when an object is within said field-of-view, said object being on a line-of-sight from said seeker causing an included angle between said line-of-sight and said boresight axis, said video signal voltage being a function of said included angle, and

(U) (c) a tracking loop having a means for using said signal voltage to steer said field-of-view so that said object remains within said field-of-view and a means for generating a low-pass filtered dynamic lag voltage from said video signal voltage, and

(U) (d) a dither waveform generator wherein a dither voltage is generated and

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(U) (e) a means for using said dither voltage to cause a dither of said boresight axis and

(U) (f) a means for causing said tracking loop to be open during said dither of said boresight axis and

(U) (g) a boresight error slope computer circuit for generating a transfer characteristic having a measurable curvature, said transfer characteristic being a voltage functionally related to said included angle, said angle resulting from said dither, and

(C) (h) a boresight error slope computer circuit for generating a correction voltage, said correction voltage being a function of said curvature of said transfer characteristic in a neighborhood of said line of sight, and

(U) (i) an additive means for using said correction voltage to reduce said boresight error slope.

(U) Claim 2, cancel and rewrite as new claim 4 as follows:

(U) 4. The boresight error slope reduction system of claim 3 wherein said tracking loop includes an automatic gain control amplifier and an automatic gain control computer, said automatic gain control computer comprising:

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~~CONFIDENTIAL~~

transfer characteristic having a mean [illegible] curvature, said transfer characteristic being a voltage functionally related to said included angle, said angle resulting from said dither, and

(C) (h) a boresight error slope computer circuit for generating a correction voltage, said correction voltage being a function of said curvature of said transfer characteristic in a neighborhood of said line of sight, and

(U) (i) an additive means for using said correction voltage to reduce said boresight error slope.

(U) Claim 2, cancel and rewrite as new claim 4 as follows:

(U) 4. The boresight error slope reduction system of claim 3 wherein said tracking loop includes an automatic gain control amplifier and an automatic gain control computer, said automatic gain control computer comprising:

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CONFIDENTIAL

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D000339

(U) (a) a transfer characteristic sample-and-hold circuit for obtaining two samples of said transfer characteristic, a first sample being obtained at a first instant, said first instant being the instant of coincidence between said wide bandwidth video signal voltage and said low-pass filtered dynamic lag voltage, and a second sample being obtained at a second instant, said second instant being at a different time from said first instant, and

(U) (b) a signal subtracter circuit for generating a direct current signal voltage by subtracting said first sample of said transfer characteristic from said second sample of said transfer characteristic and

(U) (c) a dither sample-and-hold circuit for obtaining two samples of said dither voltage, a first sample of said dither voltage being obtained at said first instant and a second sample of said dither voltage being obtained at said second instant, and

(U) (d) a dither subtracter circuit for generating a direct current reference voltage by subtracting said first sample of said dither voltage from said second sample of said dither voltage and

(U) (e) an automatic gain control subtracter circuit for generating an automatic gain control voltage by subtracting said direct current reference voltage from said direct current signal voltage and a seco[illegible]stant, said second instant [illegible]ing at a different time fr[illegible]aid first instant, and

(U) (b) a signal subtracter circuit for generating a direct current signal voltage by subtracting said first sample of said transfer characteristic from said second sample of said transfer characteristic and

(U) (c) a dither sample-and-hold circuit for obtaining two samples of said dither voltage, a first sample of said dither voltage being obtained at said first instant and a second sample of said dither voltage being obtained at said second instant, and

(U) (d) a dither subtracter circuit for generating a direct current reference voltage by subtracting said first sample of said dither voltage from said second sample of said dither voltage and

(U) (e) an automatic gain control subtracter circuit for generating an automatic gain control voltage by subtracting said direct current reference voltage from said direct current signal voltage and

UNCLASSIFIED

(U) (f) a means for applying said automatic gain control voltage to said automatic gain control amplifier.

(U) Please add two new claims as follows:

(U) 5. The boresight error slope reduction system of claim 3 wherein said seeker is a radio frequency seeker having a phase sensing monopulse antenna and said additive means is a phase shifter.

(U) 6. The boresight error slope reduction system of claim 3 wherein said seeker is an infra-red seeker and said additive means is an adder circuit for adding said correction voltage to said dynamic lag voltage.

monopulse ... a and said additive means ... phase shifter.

(U) 6. The boresight error slope reduction system of claim 3 wherein said seeker is an infra-red seeker and said additive means is an adder circuit for adding said correction voltage to said dynamic lag voltage.

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UNCLASSIFIED

EXHIBIT 11

Duplic

In the United States Patent and Trademark Office

EXHIBIT 11

Serial Nr.: 06/859,033

Filed: 04/25/1986

Inventor(s): ALTON B. HORNBACK

Title: REAL TIME BORESIGHT ERROR SLOPE SENSOR (u)

Examiner and G.A.U.: CHARLES T. JORDAN/GAU 221

RECEIVED
MAY 11 1987
GROUP 220
LICENSING & REVIE

SUPPLEMENTAL Amendment A

CLASSIFIED ANNEX

Date: 6 MAY 1987

Commissioner of Patents and Trademarks
Washington, District of Columbia 20231

Sir:

In response to the Office Letter mailed 02/20, 1987, please amend the above application as follows:

Alton B. Hornback
ALTON B. HORNBACK, APPLICANT

Original classification authority:
DOD 5200.1-R/AFR 205-1, "Information Security Program Regulation", and IAW DOD 5200.1-H/AFR 205-37.

Agency and office or origin:
Air Force Armament Laboratory/DLM (AD)
Eglin AFB FL 32542

Contract No. IRAD 111182	☐ Review For Declassification		☐ Declassify On 15 OCT 99
Classified by AFAL/DLM (AD) EGLIN AFB		☐ Downgrade To	On

CLASSIFIED ANNEX
Date: 6 1987

MAY
GROUP 220
LICENSING & REVIEW

Commissioner of Patents and Trademarks
Washington, District of Columbia 20231

Sir:

In response to the Office Letter mailed 02/20, 1987, please amend the above application as follows:

Alton B. Hornback
ALTON B. HORNBACK, APPLICANT

Original classification authority:
DOD 5200.1-R/AFR 205-1, "Information Security Program Regulation", and IAW DOD 5200.1-H/AFR 205-37.

Agency and office or origin:
Air Force Armament Laboratory/DLM (AD)
Eglin AFB FL 32542

Contract No. IRAD 111182	☐ Review For Declassification	☐ Declassify On 15 OCT 99	
Classified by AFAL/DLM (AD) EGLIN AFB	☐ Downgrade To	On	

-A47a-

D000322

UNCLASSIFIED

(U) Claims:

(U) Claim 1, cancel and rewrite as new claim 3 as follows:

(C) 3. A boresight error slope reduction system for sensing, in real time, a boresight error slope in a homing seeker, said system comprising:

(U) (a) a seeker having a steerable field-of-view, said field-of-view having an electrical boresight axis, and

(U) (b) a receiver wherein a video signal voltage is obtained when an object is within said field-of-view, said object being on a line-of-sight from said seeker thereby causing an included angle between said line-of-sight and said boresight axis, said video signal voltage being a function of said included angle, and

(U) (c) a tracking loop having a means for using said video signal voltage to generate a filtered dynammc lag voltage, said dynamic lag voltage being used to steer said field-of-view so that said object remains within said field-of-view, and

(U) (d) a dither waveform generator wherein a dither voltage is generated and

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(U) (a) a [illegible]er having a steerable fiel[illegible]-view, said field-of-view having an electrical boresight axis, and

(U) (b) a receiver wherein a video signal voltage is obtained when an object is within said field-of-view, said object being on a line-of-sight from said seeker thereby causing an included angle between said line-of-sight and said boresight axis, said video signal voltage being a function of said included angle, and

(U) (c) a tracking loop having a means for using said video signal voltage to generate a filtered dynammc lag voltage, said dynamic lag voltage being used to steer said field-of-view so that said object remains within said field-of-view, and

(U) (d) a dither waveform generator wherein a dither voltage is generated and

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(U) (e) a means for using said dither voltage to cause a dither of said boresight axis and

(U) (f) a means for causing said tracking loop to be open during said dither of said boresight axis and

(U) (g) a boresight error slope computer circuit for generating a transfer characteristic having a measurable curvature, said transfer characteristic being a voltage functionally related to said included angle, said angle resulting from said dither, and

(C) (h) a boresight error slope computer circuit for generating a correction voltage, said correction voltage being a function of said curvature of said transfer characteristic in a neighborhood of said line of sight, and

(U) (i) an additive means for using said correction voltage to reduce said boresight error slope.

(U) Claim 2, cancel and rewrite as new claim 4 as follows:

(U) 4. The boresight error slope reduction system of claim 3 wherein said tracking loop includes an automatic gain control amplifier and an automatic gain control computer, said automatic gain control computer comprising:

UNCLASSIFIED

tran haracteristic having a me ive curvature, said transfer characteristic being a voltage functionally related to said included angle, said angle resulting from said dither, and

(C) (h) a boresight error slope computer circuit for generating a correction voltage, said correction voltage being a function of said curvature of said transfer characteristic in a neighborhood of said line of sight, and

(U) (i) an additive means for using said correction voltage to reduce said boresight error slope.

(U) Claim 2, cancel and rewrite as new claim 4 as follows:

(U) 4. The boresight error slope reduction system of claim 3 wherein said tracking loop includes an automatic gain control amplifier and an automatic gain control computer, said automatic gain control computer comprising:

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CONFIDENTIAL

-A49a-

(U) (a) a transfer characteristic sample-and-hold circuit for obtaining two samples of said transfer characteristic, a first sample being obtained at a first instant, said first instant being the instant of coincidence between said video signal voltage and said filtered dynamic lag voltage, and a second sample being obtained at a second instant, said second instant being at a different time from said first instant, and

(U) (b) a signal subtracter circuit for generating a direct current signal voltage by subtracting said first sample of said transfer characteristic from said second sample of said transfer characteristic and

(U) (c) a dither sample-and-hold circuit for obtaining two samples of said dither voltage, a first sample of said dither voltage being obtained at said first instant and a second sample of said dither voltage being obtained at said second instant, and

(U) (d) a dither subtracter circuit for generating a direct current reference voltage by subtracting said first sample of said dither voltage from said second sample of said dither voltage and

(U) (e) an automatic gain control subtracter circuit for generating an automatic gain control voltage by subtracting said direct current reference voltage from said direct current signal voltage and second ... being at a different ... from said first instant, and

(U) (b) a signal subtracter circuit for generating a direct current signal voltage by subtracting said first sample of said transfer characteristic from said second sample of said transfer characteristic and

(U) (c) a dither sample-and-hold circuit for obtaining two samples of said dither voltage, a first sample of said dither voltage being obtained at said first instant and a second sample of said dither voltage being obtained at said second instant, and

(U) (d) a dither subtracter circuit for generating a direct current reference voltage by subtracting said first sample of said dither voltage from said second sample of said dither voltage and

(U) (e) an automatic gain control subtracter circuit for generating an automatic gain control voltage by subtracting said direct current reference voltage from said direct current signal voltage and

-A50a-

(U) (f) a means for applying said automatic gain control voltage to said automatic gain control amplifier.

(U) Please add two new claims as follows:

(U) 5. The boresight error slope reduction system of claim 3 wherein said seeker is a radio frequency seeker having a phase sensing monopulse antenna and said additive means is a phase shifter.

(U) 6. The boresight error slope reduction system of claim 3 wherein said seeker is an infra-red seeker and said additive means is an adder circuit for adding said correction voltage to said dynamic lag voltage.

(U) 6. The boresight error slope reduction system of claim 3 wherein said seeker is an infra-red seeker and said additive means is an adder circuit for adding said correction voltage to said dynamic lag voltage.

UNCLASSIFIED

-A51 a-

UNITED STATES DEPARTMENT OF COMMERCE
Patent and Trademark Office
Address: COMMISSIONER OF PATENTS AND TRADEMARKS
Washington, D.C. 20231

SERIAL NUMBER	FILING DATE	FIRST NAMED APPLICANT	ATTORNEY DOCKET NO.
		HORNBACK	

ALTON B. HORNBACK
5858 BLOCH STREET
SAN DIEGO, CA 92122

EXHIBIT 12

EXAMINER	
JORDAN	
ART UNIT	PAPER NUMBER
	7

DATE MAILED: 06/11/87

This is a communication from the examiner in charge of your application.

COMMISSIONER OF PATENTS AND TRADEMARKS

☐ This application has been examined ☒ Responsive to communication filed on 5/4/87 & 5/11/87 ☐ This action is made final.

~~A shortened~~ statatutory period for response to this action is set to expire 6 month(s), ——— days from the date of this letter.
Failure to respond within the period for response will cause the application to become abandoned. 35 U.S.C. 133

Part I THE FOLLOWING ATTACHMENT(S) ARE PART OF THIS ACTION:

1. ☐ Notice of References Cited by Examiner, PTO-892.
2. ☐ Notice re Patent Drawing, PTO-948.
3. ☐ Notice of Art Cited by Applicant, PTO-1449
4. ☐ Notice of informal Patent Application, Form PTO-152
5. ☐ Information on How to Effect Drawing Changes, PTO-1474
6. ☐ ______

Part II SUMMARY OF ACTION

1. ☒ Claims 3-6 are pending in the application.

   Of the above, claims ______ are withdrawn from consideration.

2. ☒ Claims 1 and 2 have been cancelled.
3. ☒ Claims 3-6 are allowed.
4. ☐ Claims ______ are rejected.
5. ☐ Claims ______ are objected to.
6. ☐ Claims ______ are subject to restriction or election requirement.
7. ☐ This application has been filed with informal drawings which are acceptable for examination purposes until such time as allowable subject matter is indicated.
8. ☐ Allowable subject matter having been indicated, formal drawings are required in response to this Office action.
9. ☐ The corrected or substitute drawings have been received on ______. These drawings are ☐ acceptable; ☐ not acceptable (see explanation).
10. ☐ The ☐ proposed drawing correction and/or the ☐ proposed additional or substitute sheet(s) of drawings, filed on ______. has (have) been ☐ approved by the examiner. ☐ disapproved by the examiner (see explanation).

-A59-

11. ☐ The proposed drawing correction, filed ______, has been ☐ approved. ☐ disapproved (see explanation). However, the Patent and Trademark Office no longer makes drawing changes. It is now applicant's responsibility to ensure that the drawings are corrected. Corrections MUST be effected in accordance with the instructions set forth on the attached letter "INFORMATION ON HOW TO EFFECT DRAWING CHANGES", PTO-1474.

(u) 1. This application is in condition for allowance except for the following formal matter:

Except for the presence of papers with security classification markings thereon this case is otherwise in condition for allowance.

Accordingly, applicant is required within the statutory period for response to either (1) effect removal of the security classification markings, or (2) request the agency responsible therefore to impose a Secrecy Order.

Prosecution on the merits is closed in accordance with the practice under ex parte Quayle, 1935 C.D. 11, 453 O.G. 213.

A STATUTORY PERIOD FOR RESPONSE TO THIS ACTION IS SET TO EXPIRE SIX MONTHS FROM THE DATE OF THIS LETTER.

(u) 2. Any inquiry concerning this communication should be directed to Charles T. Jordan at telephone number 703-557-4911.

Charles T. Jordan/rg-5

05-27-87

CHARLES T. JORDAN
EXAMINER
GROUP ART UNIT 221

EXHIBIT 13

IN THE UNITED STATES COURT OF FEDERAL CLAIMS

ALTON B. HORNBACK, Plaintiff, v. THE UNITED STATES OF AMERICA, Defendant.	No. 99-38 C Judge Hewitt

DEFENDANT'S RESPONSE TO PLAINTIFF'S SECOND SET OF REQUESTS FOR PRODUCTION OF DOCUMENTS AND THINGS

Defendant, the United States, pursuant to RCFC 34, hereby responds to Plaintiff's Second Set of Requests for Production of Documents and Things, served September 1, 2001.

6. Requests for Production of Documents and Things No. 6.

During the Status Conference of 19 March 2001, Counsel for Defense stated that he had uncovered some errors in the patent claims which Plaintiff had failed to note. The reference for that statement could only have been the copy of the patent application then on file at the Department of Justice. See DEFENDANT'S RESPONSE TO PLAINTIFF'S MOTION TO COMPEL DISCOVERY at 1, Case No. 98-58 C, dated September 3, 1998: "The copy of plaintiff's patent application available at the Department of Justice for defense counsel's inspection was ordered in 1991, and does not contain copies of the post 1990 documents in question."

Accordingly, please produce, and send to Plaintiff, a copy of the patent application (minus page 7, if desired) which has been on file at the Department of Justice since 1990.

Response

Defendant objects to this request for production because plaintiff is already in possession, custody, and control of the documents requested, namely, the prosecution history of United States Patent No. 6,079,666 produced by Defendant with Bates stamped numbers D000001 – D000287. Defendant, however, produces concurrently herewith a copy of the prosecution history of United States Patent No. 6,079,666, through August 6, 1990, Bates stamped number D000288 through D000425. Defendant has removed three pages, D000329, D000334, and D000376, that contain classified information.

Dated: October 4, 2001

Respectfully submitted,

ROBERT D. McCALLUM, JR.
Assistant Attorney General

VITO J. DiPIETRO
Director

Susan L. Christenberry

SUSAN L. CHRISTENBERRY
Attorney
Commercial Litigation Branch
Civil Division
Department of Justice
Washington, D. C. 20530
Phone: (202) 616-8116

In the United States Patent and Trademark Office

EXHIBIT 14

Serial Nr.: 859,033

Filed: 04-25-86

Inventor(s): ALTON B. HORNBACK

Title: REAL TIME BORESIGHT ERROR SLOPE SENSOR

Examiner and G.A.U.: CHARLES T. JORDAN /221

Date: 5 June 1998

Subject: Request for copy of Application No 06/859,033

Commissioner of Patents and Trademarks
P.O. Box 10
Washington, D.C., 20231

Sir:

Please mail copy of subject Patent Application to Applicant at address listed below. Enclosed, please find check in the amount of $15.00 for required fee.

Very respectfully,

Alton B. Hornback

Alton B. Hornback
5650 Bloch Street
San Diego, CA. 92122
(619) 453-3334

ACCOUNT NR. 24645-03405

CHECK NR. 1459, $15.00 PAID 6-19th

-A57-

ALTON B. HORNBACK
5650 Bloch Street
San Diego, CA 92122
(858) 453-3334
22 June 1999

EXHIBIT 15

In re Application of
Alton B. Hornback
SERIAL NO. 06/859,033
FILED: April 25, 1986
FOR: REAL TIME BORESIGHT ERROR SLOPE SENSOR

Attn. Charles T. Jordan, GAU 3641

Your response of 04 June 1999, postmarked 17 June 1999, to my "STATUS INQUIRY" leaves two important issues unresolved.

1. Classification Status of Claims 3-6. You stated that the patent application had been declassified and that a copy of the patent application was mailed June 9, 1999. However, that copy contained only the cancelled claims 1-2, but omitted the allowed claims 3-6, indicating that those claims remain classified. If those claims have, in fact, been declassified, please forward a copy of claims 3-6 which I have been denied because of the previous classification. On the other hand, if those claims remain classified, please so state. Contrary to the PTO letter dated 6 January 1998 (Aattachment 1), that determination is made by the sponsoring agency, pursuant to 35 U.S.C 181, and not by applicant.

2. Have ALL Secrecy Orders Been Rescinded? Your letter stated: "[s]ecrecy orders dated subsequent to the original secrecy order due to modifications to the secrecy order format or changes in sponsoring agency have been rescinded". (Emphasis added). Attachment 2 is a copy of the original Secrecy Order which states: "[t]he above-identified patent application has been found to contain subject matter which discloses classifiable information". (Emphasis added). On the other hand, Attachment 3 is a copy of the most recent Secrecy Order with check marks in blocks reading: "This application is CLASSIFIED at the level of SECRET". Clearly, that most recent Secrecy Order is not just "a modification to the (original) secrecy order format", nor does it specify "changes in sponsoring agency". Its contents and specifications, as well as format, are totally different from those of the original Secrecy Order. Accordingly, have ALL Secrecy Orders, includinhg that most recent Secrecy Order, which have been imposed on subject patent application, been rescinded?

Alton B. Hornback

Alton B. Hornback, Applicant

Attachments : 3, as noted.

UNITED STATES DEPARTMENT OF COMMERCE
Patent and Trademark Office
ASSISTANT SECRETARY AND COMMISSIONER
OF PATENTS AND TRADEMARKS
Washington, D.C. 20231

EXHIBIT 16

In re Application of:
Alton B. Hornback
SERIAL NO. 06/859,033
FILED: April 25, 1986
FOR: REAL TIME BORESIGHT ERROR SLOPE SENSOR

STATUS INQUIRY

MAILED

JUL 2 1 1999

Office of the Director
Group 3600

This is in response to your letter received June 25, 1999. As previously indicated, **ALL** secrecy orders in the above application have been rescinded and the application, including all claims therein have been declassified.

Your request for a copy of the application was for a copy of the application as originally filed and the application as originally filed contained only claims 1 and 2. The copy of the patent application as originally filed was mailed on June 9, 1999. If applicant desires a complete copy of the **file contents**, he should address his request to the Certification Branch of the Office.

The application has been forwarded to the Office of Publications for processing of the patent grant.

Charles T. Jordan

Charles T. Jordan
Supervisory Patent Examiner
Group Art Unit 3641

IN THE UNITED STATES COURT OF FEDERAL CLAIMS

EXHIBIT 17

ALTON B. HORNBACK,	)	
Plaintiff,	)	
	)	
v.	)	No. 99-38 C
	)	
THE UNITED STATES OF AMERICA,	)	Judge Andewelt
	)	
Defendant.	)	

ANSWER

Defendant the United States hereby answers plaintiff's Complaint, filed January 25, 1999. Numbered paragraphs I through IV below respond to each corresponding numbered section of the Complaint. Upon current information and belief, all allegations of the Complaint are denied except to the extent expressly admitted below.

I. CAUSE OF ACTION

In response to section I of plaintiff's Complaint, defendant admits the following:

A. On April 25, 1986, plaintiff filed U.S. Patent Application Serial No. 06/859,033, titled "Real-Time Boresight Error Slope Sensor," now U.S. Patent No. 6,079,666.

B. On August 24, 1987, the Patent and Trademark Office ("PTO") imposed a secrecy order on plaintiff's patent application pursuant to 35 U.S.C. § 181.

plaintiff failed to comply with the requirements of at least 35 U.S.C. § 112, and perhaps for other reasons which, when ascertained, defendant prays leave to add to this Answer or to otherwise give notice to plaintiff.

3. Plaintiff is entitled to no damages because each invention described or claimed in U.S. Patent Application Serial No. 06/859,033 possessed no value.

4. Defendant's investigation is not yet complete, and there may be additional defenses which, when ascertained, defendant prays leave to add to this Answer by amendment.

WHEREFORE, defendant respectfully requests that the Court:

A. dismiss the Complaint with prejudice, without any judgment or other relief whatsoever for plaintiff;

B. declare all claims of U.S. Patent No. 6,079,666 invalid for failure to comply with the requirements set forth in 35 U.S.C. § 112; and

-A61-

C. grant defendant judgment for its costs, its attorney's fees, and such other and further relief as the Court may deem just and proper.

Respectfully submitted,

STUART E. SCHIFFER
Acting Assistant Attorney General

VITO J. DiPIETRO
Director

Dated: June 4, 2001

[signature]

CAMERON ELLIOT
Attorney
Commercial Litigation Branch
Civil Division
Department of Justice
Washington, D. C. 20530
Phone: (202) 307-0333

OF COUNSEL:
THOMAS J. BYRNES
Attorney

JS 44 (Rev. 11/04)

CIVIL COVER SHEET

The JS 44 civil cover sheet and the information contained herein neither replace nor supplement the filing and service of pleadings or other papers as required by law, except as provided by local rules of court. This form, approved by the Judicial Conference of the United States in September 1974, is required for the use of the Clerk of Court for the purpose of initiating the civil docket sheet. (SEE INSTRUCTIONS ON THE REVERSE OF THE FORM.)

I. (a) PLAINTIFFS /PETITIONER
ALTON B. HORNBACK

DEFENDANTS /RESPONDENT
THE UNITED STATES OF AMERICA

FILED
08 JAN 23 AM 9:30

(b) County of Residence of First Listed Plaintiff SAN DIEGO
(EXCEPT IN U.S. PLAINTIFF CASES)

County of Residence of First Listed Defendant
(IN U.S. PLAINTIFF CASES ONLY)
NOTE: IN LAND CONDEMNATION CASES, USE THE LOCATION OF THE LAND INVOLVED.

(c) Attorney's (Firm Name, Address, and Telephone Number) (858) 453-3334
ALTON B. HORNBACK, PRO SE
5660 BLOCH STREET, SAN DIEGO, CA 92122

Attorneys (If Known)
'08 CV 0127 WQH BLM
BY: DEPUTY

II. BASIS OF JURISDICTION (Place an "X" in One Box Only)

- ☐ 1 U.S. Government Plaintiff
- ☐ 3 Federal Question (U.S. Government Not a Party)
- ☒ 2 U.S. Government Defendant
- ☐ 4 Diversity (Indicate Citizenship of Parties in Item III)

III. CITIZENSHIP OF PRINCIPAL PARTIES (Place an "X" in One Box for Plaintiff and One Box for Defendant) (For Diversity Cases Only)

	PTF	DEF		PTF	DEF
Citizen of This State	☐ 1	☐ 1	Incorporated or Principal Place of Business In This State	☐ 4	☐ 4
Citizen of Another State	☐ 2	☐ 2	Incorporated and Principal Place of Business In Another State	☐ 5	☐ 5
Citizen or Subject of a Foreign Country	☐ 3	☐ 3	Foreign Nation	☐ 6	☐ 6

IV. NATURE OF SUIT (Place an "X" in One Box Only)

CONTRACT
- ☐ 110 Insurance
- ☐ 120 Marine
- ☐ 130 Miller Act
- ☐ 140 Negotiable Instrument
- ☐ 150 Recovery of Overpayment & Enforcement of Judgment
- ☐ 151 Medicare Act
- ☐ 152 Recovery of Defaulted Student Loans (Excl. Veterans)
- ☐ 153 Recovery of Overpayment of Veteran's Benefits
- ☐ 160 Stockholders' Suits
- ☐ 190 Other Contract
- ☐ 195 Contract Product Liability
- ☐ 196 Franchise

REAL PROPERTY
- ☐ 210 Land Condemnation
- ☐ 220 Foreclosure
- ☐ 230 Rent Lease & Ejectment
- ☐ 240 Torts to Land
- ☐ 245 Tort Product Liability
- ☐ 290 All Other Real Property

TORTS

PERSONAL INJURY
- ☐ 310 Airplane
- ☐ 315 Airplane Product Liability
- ☐ 320 Assault, Libel & Slander
- ☐ 330 Federal Employers' Liability
- ☐ 340 Marine
- ☐ 345 Marine Product Liability
- ☐ 350 Motor Vehicle
- ☐ 355 Motor Vehicle Product Liability
- ☐ 360 Other Personal Injury

PERSONAL INJURY
- ☐ 362 Personal Injury - Med. Malpractice
- ☐ 365 Personal Injury - Product Liability
- ☐ 368 Asbestos Personal Injury Product Liability

PERSONAL PROPERTY
- ☐ 370 Other Fraud
- ☐ 371 Truth in Lending
- ☐ 380 Other Personal Property Damage
- ☐ 385 Property Damage Product Liability

CIVIL RIGHTS
- ☐ 441 Voting
- ☐ 442 Employment
- ☐ 443 Housing/ Accommodations
- ☐ 444 Welfare
- ☐ 445 Amer. w/Disabilities - Employment
- ☐ 446 Amer. w/Disabilities - Other
- ☐ 440 Other Civil Rights

PRISONER PETITIONS
- ☐ 510 Motions to Vacate Sentence

Habeas Corpus:
- ☐ 530 General
- ☐ 535 Death Penalty
- ☐ 540 Mandamus & Other
- ☐ 550 Civil Rights
- ☐ 555 Prison Condition

FORFEITURE/PENALTY
- ☐ 610 Agriculture
- ☐ 620 Other Food & Drug
- ☐ 625 Drug Related Seizure of Property 21 USC 881
- ☐ 630 Liquor Laws
- ☐ 640 R.R. & Truck
- ☐ 650 Airline Regs.
- ☐ 660 Occupational Safety/Health
- ☐ 690 Other

LABOR
- ☐ 710 Fair Labor Standards Act
- ☐ 720 Labor/Mgmt. Relations
- ☐ 730 Labor/Mgmt.Reporting & Disclosure Act
- ☐ 740 Railway Labor Act
- ☐ 790 Other Labor Litigation
- ☐ 791 Empl. Ret. Inc. Security Act

BANKRUPTCY
- ☐ 422 Appeal 28 USC 158
- ☐ 423 Withdrawal 28 USC 157

PROPERTY RIGHTS
- ☐ 820 Copyrights
- ☒ 830 Patent
- ☐ 840 Trademark

SOCIAL SECURITY
- ☐ 861 HIA (1395ff)
- ☐ 862 Black Lung (923)
- ☐ 863 DIWC/DIWW (405(g))
- ☐ 864 SSID Title XVI
- ☐ 865 RSI (405(g))

FEDERAL TAX SUITS
- ☐ 870 Taxes (U.S. Plaintiff or Defendant)
- ☐ 871 IRS—Third Party 26 USC 7609

OTHER STATUTES
- ☐ 400 State Reapportionment
- ☐ 410 Antitrust
- ☐ 430 Banks and Banking
- ☐ 450 Commerce
- ☐ 460 Deportation
- ☐ 470 Racketeer Influenced and Corrupt Organizations
- ☐ 480 Consumer Credit
- ☐ 490 Cable/Sat TV
- ☐ 810 Selective Service
- ☐ 850 Securities/Commodities/ Exchange
- ☐ 875 Customer Challenge 12 USC 3410
- ☐ 890 Other Statutory Actions
- ☐ 891 Agricultural Acts
- ☐ 892 Economic Stabilization Act
- ☐ 893 Environmental Matters
- ☐ 894 Energy Allocation Act
- ☐ 895 Freedom of Information Act
- ☐ 900 Appeal of Fee Determination Under Equal Access to Justice
- ☐ 950 Constitutionality of State Statutes

V. ORIGIN (Place an "X" in One Box Only)

☒ 1 Original Proceeding ☐ 2 Removed from State Court ☐ 3 Remanded from Appellate Court ☐ 4 Reinstated or Reopened ☐ 5 Transferred from another district (specify) ☐ 6 Multidistrict Litigation ☐ 7 Appeal to District Judge from Magistrate Judgment

VI. CAUSE OF ACTION

Cite the U.S. Civil Statute under which you are filing (Do not cite jurisdictional statutes unless diversity): 35 U.S.C. SECTION 131

Brief description of cause: PATENT DOES NOT ESTABLISH PETIONER AS LEGAL OWNER. ISSUED PATENT DOES NOT DEFINE DISCLOSED INVENTION.

VII. REQUESTED IN COMPLAINT:

☐ CHECK IF THIS IS A CLASS ACTION UNDER F.R.C.P. 23 DEMAND $ 0

CHECK YES only if demanded in complaint: JURY DEMAND: ☐ Yes ☐ No

VIII. RELATED CASE(S) IF ANY

(See instructions): JUDGE SAMMARTINO DOCKET NUMBER 07-CV-1694 JLS
JUDGE SAMMARTINO DOCKET NUMBER 07-CV-0289 JLS

DATE 23 January 2008 SIGNATURE OF ATTORNEY OF RECORD Alton B. Hornback, PRO SE

FOR OFFICE USE ONLY

RECEIPT # 146716 AMOUNT $350- 1/23/08 GH APPLYING IFP ______ JUDGE ______ MAG. JUDGE ______

UNITED STATES
DISTRICT COURT
SOUTHERN DISTRICT OF CALIFORNIA
SAN DIEGO DIVISION

# 146716 - BH
*** * C O P Y * ***
January 23, 2008
09:30:55

Civ Fil Non-Pris
USAO #.: 08CV0127 CIVIL FILING
Judge..: WILLIAM Q HAYES
Amount.: $350.00 CC

Total-> $350.00

FROM: HORNBACK V. U.S.A.
CIVIL FILING
AMEX AUTH# 543172